A Theory of Coordination Voids in Dynamic Inter-Organisational Relationships: A study of social housing projects in England

A Thesis Submitted in Fulfilment of the Requirements for the Award of the Degree of Doctor of Philosophy

Nuno R. Barros de Oliveira
Department of Management
The London School of Economics and Political Science

2013

Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I warrant that this authorisation does not, to the best of my belief, infringe the rights of any third party.

I declare that my thesis consists of **81.593 words**.

Acknowledgements

My time as a PhD student is better described as a journey of discovery of myself as a researcher as much as a person. In conducting my research, it has become clear that the support I have received from many people was fundamental to succeed in this task. I am truly grateful.

First and foremost, I thank my supervisor, Nathalie Mitev, for her guidance and patience throughout my doctoral studies. She has always had a lot of confidence in my work, even when I was more productive at bringing up new ideas than pursuing any. I appreciate her inspiration and support, whether it took the form of a conversation at a local coffee shop, her office or the rooftop of the LSE's New Academic Building. I hope we can continue this collaboration.

I am very grateful to numerous interlocutors who aided my research. At the LSE, I am glad that I had the opportunity to exchange ideas with faculty members across the Department of Management. I thank Daniel Buenza, Daniela Lup, Richard Hyman, Susan Hill and Susan Scott. I also thank Michael Barzelay, who was always insightful about developing an argument and introduced me to Simon Murray, who enriched my research with his extensive experience of UK industry. I am also thankful for the support of Leo Beattie, Imran Iqbal and Fran White.

Outside of the LSE, I am grateful to all the managers who took the time to contribute to my research and aided me to understand the UK's building industry and the richness of each the story of each case-study. I also want to express my gratitude to all who listened to my presentations of my research, at academic conferences across Europa and the USA. I especially thank Andrew Van de Ven, Benjamin Hallen, Candace Jones, Fabrice Lumineau, Isabel Fernandez-Mateo, Jason Davis, Marco Tortoriello, Mark Ebers, Nicole Gillespie and Tiziana Casciaro. I am grateful to the many PhD students I met at Doctoral Consortia, from whom I learnt immensely, and for the support network we developed that spans across all continents.

I am grateful to my family, who encouraged and supported me through every moment of my doctoral research. I am immensely grateful for the friendship of Almudena Cañibano, Cecile Emery, Daniel Curto-Miller, Larissa Barnett, Maha Shaikh, Stephen Champion, Miguel Monjardinho and Wifak Houij-Gueddana. I am

equally thankful to João Ferradeira for comforting my *saudade* and Vilhena Mesquita who always found a word of support to put in his postcards. For those I have not mentioned, I am equally grateful for their unconditional support during this journey and I thank them immensely.

Last but not least, I thank FCT – Fundação para a Ciência e a Tecnologia (Grant # SFRH/BD /31736/2006) for funding my doctoral studies. Additionally, I thank the LSE Department of Management for their generous support in the final year of this research (through the LSE Research Studentships Scheme). I am grateful to them for providing me with the opportunity to learn and discover.

Abstract

Inter-organisational relationships are at the heart of economic activity and the benefits of inter-organisational collaboration are widely reported. However, theoretical understanding of how inter-organisational relationships are coordinated and why they encounter coordination problems remains limited.

I address these questions through a study of seven social housing projects in England, completed between 2008 and 2011. Drawing on the richness of data from over 3,900 pages of minutes from meetings and project reports, I integrate social network analysis techniques (SNA) used to map dynamic inter-organisational relationships with content analysis, through which I explore coordination-related aspects.

Surprisingly, coordination proved not to be (directly) related to administrative mechanisms. Instead, I show that coordination stems from the interplay between administrative mechanisms and the structure of the inter-organisational relationships, as shown by two theoretical mechanisms: organising and relating. The former captures the finding that the use of contracting fosters hierarchy, while the latter shows that monitoring organisations foster density of inter-organisational relationships. I discover that inter-organisational relationships are coordinated through the juggling of these mechanisms over time. Furthermore, my analysis demonstrates that coordination problems stem from: contractual bottlenecks and organisational expertise-driven homophily. Interestingly, this exposes a tension between mechanisms intended to aid coordination and the manifestation of coordination problems.

Theorising on this tension, I am led to a framework of coordination voids – discontinuities in the fabric of inter-organisational relationships resulting from mechanisms intended to aid coordination, but in fact hampering coordination under certain conditions. I discuss a set of theoretical contributions to the strategic management and organisational and management theory, alongside a methodological contribution. I conclude my discussion of the contributions of this thesis by drawing practical implications for managers and policy-makers.

I hope that my study will stimulate a research agenda on the coordination of inter-organisational relationships, preferably one that also engages with societal challenges.

Keywords: Coordination; inter-organisational relationships; longitudinal SNA; meeting minutes; coordination voids; building industry.

List of Abbreviations

ACPO – The Association of Chief Police Officers

BRE – British Research Establishment

BT – British Telecommunications

CABE - Commission for Architecture and the Built Environment

CfSH – Code for Sustainable Homes

EA – Environmental Agency

EPC – Energy Performance Certificate

EBRD – European Bank for Reconstruction and Development

ESRC – The Economic and Social Research Council Research

HA – Highways Authority

HCA – Homes and Communities Agency

H&S – Health and Safety

IT (Information Technology)

JCT – Joint Contracts Tribunal

MetOffice – UK's National Weather Service (Meteorology Office)

M&E – Mechanical and Electrical (Engineering)

NGO – Non-Governmental Organisation

NLA – The Centre New London Architecture

PBFs – Project-Based Firms

PFI – Private Financing Initiative

PPP – Public Private Partnership

RIBA – The Royal Institute of British Architects

RICS – Royal Institution of Chartered Surveyors

SbD – Security by Design Certification

SIC – System of Industrial Classifications

SHP – Social Housing Partnerships

SNA – Social Network Analysis

TCA – Transaction Costs Approach

ToCV – Theory of Coordination Voids

UPVC – Unplasticised Poly Vinyl Chloride

Table of Contents

List of Tables

List of Figures

List of Multimedia Files

Introduction

The coordination of inter-organisational relationships – purposefully aligning resources and actions among interdependent organisations – is fundamental for organisations (Coase, 1937; Ring & van de Ven, 1994). Inter-organisational relationships are important since organisations are becoming increasingly dependent on external resources (Pfeffer & Salancik, 1978). Research reports numerous positive consequences of inter-organisational relationships (e.g. innovation outcomes) but it also alludes to numerous 'negative' consequences (e.g. extra costs) (Gulati & Gargiulo, 1999; Heath & Staudenmayer, 2000). The enduring problem is that we know little about the theoretical mechanisms that underpin the coordination of inter-organisational relationships. Therefore, I investigate the following two questions: (1) *How are dynamic inter-organisational relationships coordinated?* (2) *Why do coordination problems occur in dynamic inter-organisational relationships?*

A coordination perspective is important in addressing such an empirical puzzle (Gulati, Wohlgezogen, & Zhelyazkov, 2012b; Podolny & Page, 1998; van de Ven & Gordon, 1984). This persists despite an extensive repertoire of research on (1) coordination and (2) inter-organisational relationships (not always studied together). Coordination has attracted the interest of scholars across numerous fields of research. The acknowledgement that coordination is a central mechanism in social relations explains the significant interest from researchers across economics (Coase, 1937; Williamson, 1979), organisational and management theory (Grandori, 1997b; van de Ven & Gordon, 1984) and sociology (Podolny & Page, 1998; Powell, 1990).

Coordination occupies a pivotal place within many of the theories developed to analyse inter-organisational relationships, such as the Transaction Cost Approach (TCA), Resource Dependence Theory and the Social Network Approach. Notwithstanding this, researchers and practitioners are yet to understand the theoretical mechanisms that explain how the coordination of inter-organisational relationships unfolds. Here lies a spectacular shortcoming in the current research on inter-organisational relationships.

I expose this shortcoming through three interwoven observations about current theorising: (1) the divide between formal and informal mechanisms of coordination, (2) the focus on dyads and (3) the failure to address the dynamics of inter-organisational relationships (over time). The scope of my study can best be conveyed

in reference to three observations as they encapsulate my theory-driven motivation for this study on the coordination of dynamic inter-organisational relationships.

(1) **The divide between formal and informal mechanisms of coordination** can be seen in the ongoing debate on whether contracts are substitutes for or complements to trust in inter-organisational relationships (Ariño & Torre, 1998; Gulati, 1995a). This divide can best be explained by tracing the evolution of thought on inter-organisational relationships. In earlier works on the TCA (Coase, 1937; Williamson, 1979), contracts were discussed as playing a central role in the governance of transactions between organisations. Contracts are bidding agreements that set out obligations and expectations among the parties to the transaction. Contracting is located at the epicentre of the alignment of actions and resources in inter-organisational relationships (Hart, 1995; Macaulay, 1963; Stinchcombe, 1985a). Contracts are generally understood as safeguards against organisations' opportunistic behaviour (Williamson, 1979). Sanctions will apply to those parties that fail to fulfil their obligations. Alliances are an example of contractual arrangements being used to ensure control among the parties involved (Gulati, 1995b). However, the formal nature of the contract overlooks informal aspects of inter-organisational relationships.

Informal aspects are important lubricants of inter-organisational relationships (Barney & Hansen, 1994; Macaulay, 1963; Moran & Ghoshal, 1999). These include trust: one organisation's willingness to accept its vulnerability to other organisations, and its belief that other organisations will cooperate (Gulati, 1995a; Ring & van de Ven, 1992; Zaheer, McEvily, & Perrone, 1998). Trust-based ties entail a set of expectations and norms regarding social behaviour. Furthermore, research shows that trust prompts organisations' competitive advantage (Barney & Hansen, 1994). Trust-based relationships are found to be less costly, and therefore more effective, than formal contractual arrangements. Dyer and Chu (2000) show that trust among Toyota suppliers sustains their competitive advantage over General Motors.

The divide between formal and informal aspects is no narrower in the fast-growing social network approach, which stresses the structure of ties among organisations. Formal aspects of inter-organisational relationships – such as structure and position – have received a great deal of attention (Burt, 1992; Burt & Knez, 1995; Coleman, 1988; Granovetter, 1985; Gulati & Gargiulo, 1999; Uzzi, 1997; van

de Ven & Gordon, 1984; Walker, Kogut, & Shan, 1997). The structure of inter-organisational relationships is proven to shape coordination-related aspects, such as information flow and social norms (Burt, 1992; Coleman, 1988; Uzzi, 1997). Information is less novel in configurations of inter-organisational relationships that are organised around just a few organisations (Burt, 1992). However, cohesiveness – multiple ties among organisations – enhances coordination due to stability of norms and values (Coleman, 1988; Granovetter, 1985; van de Ven & Gordon, 1984). In contrast, configurations that are rich in brokerage positions provide opportunities for organisations to access novel information by connecting to other, previously unconnected, parties (Burt, 1992; Burt & Knez, 1995). Thus, organisations' positions in the network shape their possibilities for coordination with other parties. For instance, organisations in central positions access large amounts of information from other parties (Gulati & Gargiulo, 1999; Walker et al., 1997).

Although the study of formal and informal mechanisms of coordination is instructive, this divide limits our understanding of the coordination of inter-organisational relationships, I argue. Recent research attempts to bridge this divide by looking at formal and informal aspects of coordination simultaneously (Davis & Eisenhardt, 2011; Doz, 1996; Faems, Janssens, Madhok, & Van Looy, 2008; Uzzi, 1997). For instance, Doz (1996) reports that the usefulness of contracts in strategic alliances differs according to the stage the alliance has reached. Davis and Eisenhardt (2011) have found that rotating leadership among partnering organisations prompts innovation outcomes for inter-organisational collaborative arrangements.

(2) **The current theorising focuses on dyads**, as opposed to groups. In economics, this line of reasoning is at the epicentre of the TCA initiated by Coase (1937) and developed in the work of Williamson (1979, 1981, 1996). The alignment of actions between two organisations occurs through prices. The seller and the buyer come together in the marketplace, where the former seeks agreement from the latter on the price for a given transaction (either a product or a service).

The dyad level of analysis is also present in some of the foundational work of the resource dependence theory (Casciaro & Piskorski, 2005; Pfeffer & Salancik, 1978). The importance of dyads to the resource dependence theory is observable in the conceptualisation of power (Pfeffer & Salancik, 1978). One organisation's power is positively related to other organisations' dependence on its resources. Recent

theoretical developments also build on a dyadic perspective, as shown in a recent conceptualisation of power in inter-organisational relationships (Casciaro & Piskorski, 2005). Overall, a dyadic perspective is widely adopted in prior research.

It is in the social network approach that researchers move away from dyads to investigate whole configurations of inter-organisational relationships, that is sets of ties among more than two organisations (Galaskiewicz, 1985; Powell, 1990). Organisations are embedded in sets of ties with many organisations, forming a wider configuration of inter-organisational relationships (Gulati & Gargiulo, 1999; Nahapiet & Ghoshal, 1998; Podolny & Page, 1998; Sydow & Windeler, 1998). Coordination unfolds, therefore, at the level of the configuration of inter-organisational ties. For instance, Walker et al. (1997) find that the structural properties of inter-organisational ties affect the frequency with which biotechnology firms establish new relationships. Moreover, the existing structure of inter-organisational relationships changes over time.

(3) **Inter-organisational relationships are dynamic**; however, little is known about how ties among organisations change over time. Recent reviews have consistently pointed out the scarcity of empirical research on the dynamics of inter-organisational relationships (Ahuja, Soda, & Zaheer, 2012; Borgatti & Halgin, 2011; Kilduff & Brass, 2010; Provan, Fish, & Sydow, 2007). Certainly, the difficulty of collecting longitudinal data about inter-organisational relationships is a plausible explanation for this (Borgatti & Halgin, 2011; Provan et al., 2007). Still, one can hardly deny that inter-organisational relationships are, by their very nature, dynamic and this must impact on coordination.

The requirement for coordination among organisations fluctuates over time as well. In the same way that organisations are dependent on their counterparts for resources, the inputs required from each organisation change throughout the different stages of the collaboration. Consider the development of the Boeing 787 Dreamliner. Inter-organisational relationships changed constantly in order to meet the requirements at each stage of the project. Such dynamics of inter-organisational relationships were critical in addressing several problems faced by the organisations before the first Boeing 787 Dreamliner was able to take off (Gulati, Wohlgezogen, & Zhelyazkov, 2011b). Another example is experienced by the thousands of households who every year engage others to carry out building work for them. The

owner of the project may appoint an architect to design his/her home, and from there the project will progressively require the alignment of operations with engineers, the local council and building contractors. Once the drawings are completed, a main contractor will be appointed and will bring sub-contractors, such as bricklayers and plumbers, on board, employed according to the workload at each stage of the project.

It is also hard to deny that further understanding of the coordination of inter-organisational relationships is needed. The everyday lives of organisations are filled with constant change in their inter-organisational ties, stemming from production-related requirements, or just the organisations' search for new partners. The core idea here is that it is in a context of dynamic inter-organisational relationships that we most need to understand coordination, and yet that is where we know the least.

Besides my theory-driven motivations, I have also aimed to engage my research on the coordination of inter-organisational relationships with industrial and societal issues. I thus consider the UK's building industry, known for its adversarial practices of collaboration and lack of innovation, in the context of the country's enduring shortage of social housing. Limited collaboration among organisations has been consistently reported to undermine the performance of the sector, while simultaneously sustaining an increase in building costs (Gann, 1996; Latham, 1994). The managerial and policy-making implications cover two key challenges: the social housing shortage and the adaptations needed for the delivery of environmentally sustainable buildings. Over 1.84 million people in England and almost 5 million in the UK are currently waiting for social housing[1] and the increasing building costs are limiting the supply. This situation is unfolding alongside the current call for 'greener' buildings, as shown in the UK Government's report on low carbon construction[2].

Considering all of the above, I aim to further our understanding on how dynamic inter-organisational relationships are coordinated. Coordination problems have scarcely been studied to date, despite the high failures rates of inter-organisational arrangements (Kale & Singh, 2009). At best, coordination problems are only alluded to or discussed based on anecdotal examples (Heath & Staudenmayer, 2000). I will now introduce the seven chapters that constitute this thesis.

[1] *U.K. Pushes 'Social' Housing REIT Plan* by Anita Likus. Wall Street Journal, May 9, 2012.
[2] Low Carbon Construction: Innovation & Growth Team, London: HM Government (2010).

In **Chapter I**, I will review the literature on three relevant theories used to study inter-organisational relationships: the TCA, the Resource Dependence Theory and the social network approach. The assumptions and mechanisms of the coordination of inter-organisational relationships will be discussed and contrasted across these three theories. I will conclude by discussing emerging theoretical perspectives.

Chapter II will present my theoretical framework, developed to examine the coordination of inter-organisational relationships. Using a process-based approach, my framework entails antecedents, mechanisms and consequences of the coordination of inter-organisational relationships. I will structure this chapter around these three components of the process of coordination.

Sociologists, economists and organisational theorists have developed a valuable set of insights, gathered across several industries, including the building industry, biotechnology and fashion textiles. However, the limited breadth and depth of the current research on the coordination of inter-organisational relationships will prove surprising. My assessment of the current research suggests that any extrapolation regarding the coordination of inter-organisational relationships would be, as things currently stand in the literature, a 'leap of faith'. I thus identify a research opportunity to integrate research on coordination and inter-organisational relationships (e.g. the TCA and the social network approach). Furthermore, I will argue that a spectacular limitation in the current literature is exposed by the limited theoretical insight on (1) how dynamic inter-organisational relationships are coordinated, and (2) why coordination problems occur in dynamic inter-organisational relationships.

Chapter III will draw on my theoretical framework and introduce the methodology deployed in this study. I will argue that the UK's building industry is appropriate for studying the coordination of inter-organisational relationships. Due to limited research on this topic, I will show that a multiple case study of seven social housing projects is appropriate for studying questions of 'how' and 'why' (Eisenhardt, 1989; Leonard-Barton, 1990). The housing projects selected were completed between 2008 and 2011 in England; they had an average cost of £1,849,481 and involved an average of around 40 organisations.

I will draw on extensive and rich data sources including over 3,900 pages of meeting minutes and project reports to investigate the coordination of the inter-organisational relationships in question throughout the design and build life-cycle of each project (on a monthly basis). Furthermore, I will explain the need for, and development of, an in-depth approach to social networks that includes the traditions of inductive research (Glaser & Strauss, 1967) while using the social network analysis (SNA) to map the inter-organisational relationships (Galaskiewicz, 1985). This results in a unique longitudinal study of the development of coordination and coordination problems in these studied inter-organisational relationships.

Chapter IV is the first chapter in which I present my findings and, in line with inductive research, my first step of analysis is to assess the consequences of the phenomenon on which I will be theorising, namely coordination. I show that the consequences of the coordination of dynamic inter-organisational relationships vary widely across cases. I based my assessment on an empirically derived model, which led me to develop a multidimensional indicator of the consequences that entails four dimensions: 'on time and on budget', building certification, environmental sustainability and faults in the building. The cross-case differences across these dimensions will provide additional traction for my study on the coordination of dynamic inter-organisational relationships.

In **Chapter V**, I will challenge some assumptions that are usually taken for granted, and my findings show no (direct) association between the use of contracting and the hiring of management consultants, and the consequences of coordination.

Through the combination of the SNA and a qualitative analysis of the project documentation, I progressively uncover that mechanisms intended to promote coordination and the structure of inter-organisational relationships are intertwined. I will show that dynamic inter-organisational relationships are coordinated based on two theoretical mechanisms: organising and relating. The use of contracting fosters hierarchy (i.e. organising), while monitoring organisations foster a density of inter-organisational relationships (i.e. relating). The visualisation of this mechanism is enhanced by multimedia files of the inter-organisational relationships over time. Based on my longitudinal study, I will show that juggling these coordination mechanisms over time entails three distinctive stages: mobilisation, shape-up and

sustainability. Furthermore, this sequence of coordination mechanisms will be shown to explain the cross-case differences in the consequences of coordination.

Chapter VI will show why coordination problems occur in dynamic inter-organisational relationships. Due to the scarcity of prior research, and to avoid context-strapping, I will start by conceptualising coordination problems in the context of my study in building projects. I will show that they entail omissions and incompatibilities in activities, and untimely interactions among organisations.

Of the various explanations considered, coordination problems surprisingly stem from mechanisms intended to promote coordination. I will show that coordination problems occur due to two theoretical mechanisms: contractual bottlenecks and organisational expertise-driven homophily. It will be argued that these mechanisms cause discontinuities in the social fabric of inter-organisational relationships. This will appear counter-intuitive as they expose a point of tension between mechanisms intended to promote coordination and the 'causes' of coordination problems.

In **Chapter VII**, I will theorise on the mechanisms of coordination, that nevertheless hamper coordination through discontinuities in the fabric of inter-organisational relationships, which I term coordination voids. This observation will lead me to a theory of coordination voids (ToCV) insofar as I will articulate a vocabulary, theoretical underpinnings and consequences of coordination voids. This will extend the overarching argument that the administrative mechanisms of coordination and the structure of inter-organisational relationships are interwoven. I will demonstrate specific theoretical contributions that this research makes to the strategic management and organisational and management theory, as well as a methodological contribution to the organisational research methods literature. I will close my discussion of contributions by highlighting practical implications for managers and policy-makers. Last but not least, I will draw on the limitations of this study in order to suggest directions for further research.

All being considered, I shall argue that my foremost aim for this study is to motivate an inclusive research agenda on the coordination of inter-organisational networks and management scholarship that engages with enduring societal challenges.

Chapter I: Literature Review

Overview

In this chapter, I review the relevant theories on the study of inter-organisational relations: the Transaction Costs Approach; Resource Dependence Theory, and the Social Network Approach. Towards the end, I explore the relevance of emerging perspectives in the study of inter-organisational relations. Every theory is examined as a step towards developing a theoretical framework through which to study the coordination of dynamic inter-organisational relations

All the evidence we have indicates that the growth of firms is connected with the attempts of a particular group of human beings to do something

Penrose, 1959 (*in*: Penrose & Pitelis, 2009)

Organising relations of interdependence is unequivocally part of what humans do. It should be no surprise that coordination is therefore at the core of what individuals and organisations can achieve. I am interested in how organisations attain common goals through inter-organisational relations.

1. Theories of Inter-Organisational Relations

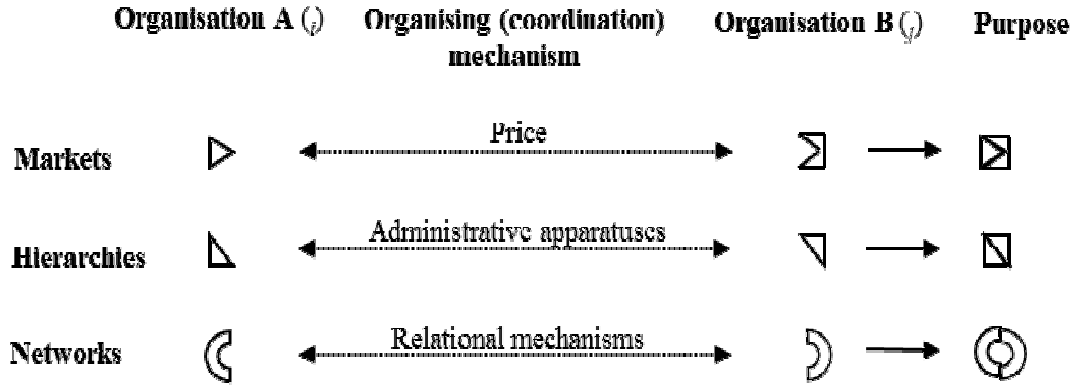
Research on economics and sociology presents compelling evidence about the antecedents, mechanisms and consequences of relations among organisations. Organisations themselves are 'designates for each person in the organisation of what decisions that person makes, and influences to which he is subject in making each of these decisions' (Simon, 1976, p. 37). I shall start the review of the existing knowledge on inter-organisational relations, which is the focus of this thesis, by introducing three fundamental ways of organising economic and social life: markets, hierarchy and networks.

Markets are places where goods or services are exchanged between one party who sells – i.e. the seller – and another party who buys – i.e. the buyer – at a bargained price. A market transaction is as follows: Organisation A ($_i$) has a good for which Organisation B ($_j$)[3] is willing to pay up to a certain value (**Figure 1**). The leading mechanism for organising actions among organisations, and indeed of coordination, is price. This brings together in the marketplace organisations ($_i$ and $_j$) with different goods or services. According to neo-classic economics, the price induces coordination in the marketplace whereby organisations seek to maximise their profits (Coase, 1937; Williamson, 1981). Consider the example of bids for contracts within the building industry. The client (e.g. the government) tenders in the marketplace for the lowest bid from the main contractors for a given job (e.g. to build a new hospital). Client and main contractor coordinate on the basis of the price – the main contractor with the lowest bid seeks to maximise profit while remaining competitive.

[3] I shall use this notation throughout the thesis, whereby $_i$ and $_j$ denote two organisations.

Hierarchies are archetypical of the systematic administration of inter-organisational relations with an imprint of bureaucratisation. Bureaucratic aspects define lines of authority and units of control (Williamson, 1975). In contrast to the linearity attached to market-induced coordination, hierarchies are purposefully organised forms of coordination (Powell, 1990). They provide authority to organisations[4]. One important procedure entailed by hierarchies is the breaking-down of tasks into sequential sub-tasks. These are further integrated among organisations. For this purpose, administrative apparatuses are put in place so that sub-tasks, performed across at least two organisations ($_i$ and $_j$), are assembled in a harmonious manner (**Figure 1**). Managerial mandates – organisations that are contracted to manage inter-organisational relations – exemplify administrative-based aspects of implementing hierarchies. Managerial mandates with regards to coordination among organisations and tasks legitimise organisational authority. Notwithstanding, a break-down of tasks among organisations is not always possible or anticipated.

Figure 1 Organising Mechanisms: Markets, hierarchies and networks



Networks are arrangements of connected organisations ($_i$ and $_j$) – i.e. through inter-organisational ties – organised in a purposeful fashion (Gulati & Gargiulo, 1999). The vital motivation for organisations to collaborate is explained by the possibility of pooling resources unavailable within individual organisations (Pfeffer & Salancik, 1978) (**Figure 1**). Consider the mobile telecommunications industry (Davis & Eisenhardt, 2011). A telecommunications operator ($_i$) with market experience develops new technology through collaboration with another ($_j$) that has

[4] Unlike the markets of transactions occurring between organisations, hierarchies can take place within and between organisations (Coase, 1937). I shall concentrate on hierarchical aspects of inter-organisational relations (as opposed to hierarchies within organisations).

the required technical skills. While the former organisation contributes market experience, the latter contributes technical skills to this venture. Coordination is sustained by relational mechanisms, such as trust among organisations (Thorelli, 1986). Trust produces 'standards of expected behaviour, reliable information, and monitoring procedures that are at least equal to those of internal hierarchical relations in discouraging malfeasance' (Ring & van de Ven, 1992, p. 492).

Certainly, the notion of markets, hierarchies and networks makes a crude distinction (Bradach & Eccles, 1989). However, this distinction has an advantage, in terms of the traceability of relevant theories developed to study inter-organisational relations. Organising mechanisms entail elements of markets, hierarchies, and networks (**Figure 1**). These foundational ideas are further developed within three theories on inter-organisational relations: (1) the transaction costs approach (TCA), (2) the resource dependence theory and (3) the social network approach.

1.1. The Transaction Cost Approach

Market transactions involve costs that are necessary to make the exchanges possible in the marketplace (Coase, 1937; Williamson, 1981). According to the TCA, inter-organisational relations are restricted to those governed by contractual arrangements – i.e. arm's-length ties.

The main quest of TCA focuses on which transactions are more efficient in the marketplace than in hierarchies – i.e. organisations (Coase, 1937). In his seminal work, Coase (1937) argues that firms exist because they are able to produce some goods internally at a lower cost than they would have to pay for them in the marketplace. Further, TCA posits that the decision to transact in the marketplace or in a hierarchy rests with a rational analysis between costs and benefits (Williamson, 1993). The price is therefore the ultimate mechanism of coordination among organisations. Contracts are safeguards against opportunism and behavioural unpredictability, according to the proponents of TCA (Williamson, 1975).

In a typical transaction between two organisations – e.g. seller ($_i$) and buyer ($_j$) of a product or service – efficiency is the relation between the costs of transacting and the value appropriated by each organisation ($_i$ and $_j$). Accordingly, the efficiency of a transaction is inversely related to three transaction costs: search, bargaining and enforcement (Coase, 1937). First, organisations have to search for an interested counterpart in the marketplace. Second, once an interested counterpart has been

found, it is unlikely that both parties to the transaction will immediately agree upon the contractual details of the deal. Rather, both parties will have to spend resources – e.g. time – on what can be termed bargaining costs. Finally, the parties draw up contractual terms that have been mutually agreed upon.

At the foundations of TCA theorising are two behavioural assumptions: bounded rationality and opportunistic behaviour (Williamson, 1981). Bounded rationality refers to individuals' limitations in terms of having an accurate and complete understanding of the market conditions, at least *ex ante* of the market transaction. Rationality is 'bounded' because individuals are not endowed with powerful analytical and data-processing apparatus (Williamson, 1981, p. 553). Individuals are neither certain of what is the 'best' transaction nor in a position to predict the behaviour of other parties. Additionally, contracts cannot completely cover all aspects of transactions (Hart, 1995). This incompleteness of contracts allows for the foremost assumption about human behaviour made in TCA: opportunistic behaviour. The counterpart is claimed to behave opportunistically – to act in its own at the expense of the counterpart's interests – in the absence of contractual jurisdiction. Opportunism is 'self-interest seeking with guile' (Williamson, 1991). Altogether, bounded rationality and the risk of opportunism lead to uncertainty in transactions.

The notion of uncertainty defines most of the TCA reasoning insofar as it exposes the limits of contracting and the concern about opportunistic behaviour. Contracts face two main limitations, vividly espoused by high uncertainty: (1) complex transactions lead to expensive enforcement and maintenance, and (2) transaction parameters and specificities are rather unpredictable. While the former limitation suggests that contracts increase the cost of any transaction, the latter creates leeway for parties to behave opportunistically. Against this backdrop, the choice of contractual arrangements requires an analysis of the characteristics of transactions.

Transaction characteristics include asset specificity, small numbers bargaining and frequency (Williamson, 1979; Williamson, 1981). Asset-specificity refers to the uniqueness of transactions, whereby specialised goods or services present more hazards to the transaction. Thus, asset-specificity increases the transaction costs. Asset specificity may be the transaction characteristic with the strongest impact as far as theoretical and practical implications are concerned (Moran & Ghoshal, 1999; Zajac & Olsen, 1993). Small numbers bargaining occurs whenever no alternative goods or services are available in the market. Therefore, the number of substitutes

inversely predicts the costs of transacting. The frequency of transactions also shapes their costs: low frequency leads to higher transaction costs and *vice versa*. Goods or services that are only occasionally transacted have higher costs of transaction because organisations have fewer opportunities to gather information.

Overall, the TCA represents a control-minded perspective on inter-organisational relations. It has been widely referenced across the fields of economics, sociology and strategy, often in the form of critiques rather than acceptance (Ghoshal & Moran, 1996; Ouchi, 1980; Powell, 1990). The TCA has been portrayed as a 'cynical caricature' of human beings. Assumptions about people's opportunistic behaviour, and the focus on dyads, are the two main criticisms. Critics argue that the TCA builds on faulty – or at least incomplete – assumptions about human motivation. Others claim that the motivation to transact is not exclusively financial, and the interdependence of resources aligns organisations (Pfeffer & Salancik, 1978). The notion of interdependence is dealt with in the resource dependence theory.

1.2. The Resource Dependence Theory

One of the leading propositions of the resource dependence theory is that organisations are dependent on resources and endowments that are available elsewhere in the environment. External resources – e.g. information – shape the possibilities for inter-organisational relations. This occurs because of mutual dependence (Casciaro & Piskorski, 2005; Pfeffer & Salancik, 1978). A further understanding of organisations from a resource dependence perspective calls for three concepts: resources, interdependence and power.

Resources are assets that are essential for organisational operations. This is true for organisations that are privately owned – i.e. firms – and those that are publically owned – i.e. universities and governmental agencies. Resources may be broadly categorised into physical, financial and information (Pfeffer & Salancik, 1978). Machinery is an example of a physical resource. For instance, carmakers ($_i$) depend on the specialist production facilities of certain suppliers such as the manufacturers of windscreens ($_j$). Financial investments are often essential in order for organisations to run their operations. Today's organisations depend on private investors – e.g. venture capitalists (Hallen, 2008) – and public funding programmes – e.g. governmental agencies (Pfeffer & Salancik, 1978). Information is also an important

resource. Information relevant to the operations of organisations is often available elsewhere in the environment (Cyert & March, 1963). Thus, organisations constantly rely on resources that are owned by other organisations, which fosters inter-organisational relations characterised by a mutual dependence on resources.

Interdependence among organisations takes shape because the possibility of action by one organisation is mutually dependent on other organisations and their resources (Pfeffer & Salancik, 1978). With the notion of interdependence in mind, scholars refer to the notion of environment constraints. That is, the resources available in the environment determine each organisation's individual possibilities for action. Interdependence is maximised if resources are critical and the availability of substitute resources is scarce. For example, Katila, Rosenberger and Eisenhardt (2008) report that the willingness of entrepreneurs to collaborate with larger organisations depends on their resource needs as well as the existence of alternative partners (other organisations that can offer the same resources).

Recently, Casciario and Piskorski (2005) refined the notion of interdependence, distinguishing between two separate concepts: that of power imbalance and that of mutual dependence. Power captures the degree of dependence among organisations such that organisation A's power ($_i$) over its counterpart, organisation B ($_j$), varies inversely to the dependence of organisation B ($_j$) on organisation A ($_i$). Thus, power is a product of the relationship rather than an attribute of the actor. Power imbalance captures the asymmetry of power between two organisations ($_i$ and $_j$), that is, the degree to which the power of one organisation is substantially different from that of its counterpart (dependence of organisation A on organisation B $\neq$ dependence of organisation B on organisation A). Mutual dependence explains the possibility that both organisations ($_i$ and $_j$) share a reliance on the resources made available in the exchange. Furthermore, power imbalance and mutual dependence are related to one another: different levels of mutual dependence can change the power imbalance (Casciaro & Piskorski, 2005).

One important consequence of interdependence and power imbalance is uncertainty. Opportunistic behaviour can emerge through the combination of uncertainty and interdependence among organisations. Uncertainty also develops from the broad environment because organisations and the availability of resources change constantly (Pfeffer & Salancik, 1978). However, organisations have limited

opportunities for managing environment-related sources of uncertainty, which explains why organisations tend to ally themselves with partner organisations.

Organisations can reduce the uncertainty associated with resource dependence by engaging in long-term arrangements of inter-organisational relations (Thompson, 1967). Joint ventures (Katila et al., 2008; Pfeffer & Nowak, 1976; Zajac & Olsen, 1993) and alliances (Baum, Calabrese, & Silverman, 2000; Gulati, 1998) are examples. The resource dependence literature suggests that interdependence predicts inter-organisational relations. For example, organisations seek financial resources from partners (Baum et al., 2000). In a critique of the TCA, Zajac and Olsen (1993) suggest that organisations engage in inter-organisational relations to create value (without it necessarily leading to opportunistic behaviour). Arguably, a preference for less formal arrangements creates value since it lowers transaction costs.

Protection mechanisms are sought so as to minimise opportunism and abuses of power. As shown by Katila et al. (2008), organisations are reluctant to seek resources from other organisations if there are no 'defence mechanisms' against the potential misappropriation of their resources – e.g. trade secrets. Besides contracts, protection mechanisms are embedded in relations among organisations. Gulati and Gargiulo (1999) suggest that, alongside considerations of resource independence, organisations are more likely to engage with partners they trust.

Concerns over reputational damage prevent opportunistic behaviour – i.e. the misappropriation of resources. Organisations are able to establish contract-relaxed ties, where trust and reputation concerns govern the inter-organisational relations. In this vein, authors intentionally employ the term 'inter-organisational relationships' to denote 'social' aspects[5] (Levine & White, 1961; Ring & van de Ven, 1994). Hereafter, I shall use the term 'inter-organisational relationships' to reflect the social aspect of inter-organisational interactions.

In summary, the concepts of resources, interdependence and power demonstrate how the resource dependence theory is relevant for understanding inter-organisational relationships (Casciaro & Piskorski, 2005; Katila et al., 2008; Pfeffer & Salancik, 1978). The resource dependence theory builds on the realm of relationships and networks. Inter-organisational relationships have just started to be

[5] The resource dependence theory borrows the notion of power from the social exchange theory (SET), in which the term 'inter-organisational relationships' represent the sociological and anthropological foundations of the SET. Still, I assert that, in this thesis, the SET is not of central use, even if allusions to it may occur.

fully explored, with the development of sociometric techniques for mapping ties systematically among organisations. Recently, the social network approach has been used to develop a detailed analysis of and theorising on inter-organisational relationships (Ahuja et al., 2012; Galaskiewicz, 1985; Gulati & Gargiulo, 1999).

1.3. The Social Network Approach

The social network approach to inter-organisational relationships builds on the sociological perspective of embeddedness, which views economic action as embedded in patterns of social relations (Coleman, 1994; Granovetter, 1985; Uzzi, 1997). The network perspective views inter-organisational relationships as a set of ties among organisations, that is, a configuration of inter-organisational relationships (Galaskiewicz, 1985). Most recent literature reviews show that the social network approach has indeed produced unique insights on inter-organisational relationships.

Network forms of organisation are '*any collection of actors ($N \geq 2$) that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve any disputes that might arise during exchange*'[6] (Podolny & Page, 1998, p. 59). This quotation shows that network forms of organisation are predominantly characterised by repeated interactions – as opposed to spontaneous ones – made in pursuit of an exchange. Unlike in the transaction economics literature, inter-organisational relationships might unfold without a fully formal, authoritative structure of contractually regulated transactions and hierarchies. Examples of network forms of organisation include alliances (Baum et al., 2000; Gulati, 1998), joint ventures (Barkema, Shenkar, Vermeulen, & Bell, 1997; Polidoro, Ahuja, & Mitchell, 2011) and research consortiums between privately-held companies and universities (George, Zahra, & Wood, 2002; Mitev & Venters, 2009).

The term 'inter-organisational relationships' is often used interchangeably with 'inter-organisational networks'. The former term tends to be used in sociology while the latter has been popularised by the advent of the SNA techniques[7]. (Hereafter, I

[6] Italicised as in the original version.

[7] The methodological aspects of SNA will be discussed thoroughly in **Chapter III – Methodology**. I deliberately draw a distinction between social networks as a 'methodology' and as a 'theoretical approach'. Prior research often uses the label 'network theory' to refer to the method and theoretical aspects of the social network approach. This distinction is necessary and pertinent to prevent confusion (Borgatti & Halgin, 2011; Kilduff & Brass, 2010).

shall also use both terms interchangeably.) To ensure an essential understanding of the social network approach, before I deal with the theoretical underpinnings, I shall now introduce the fundamental methodological notions of the approach. An inter-organisational relationship is represented as a tie between at least two organisations. Each organisation is treated as a node. Consider the following example: organisation A ($_i$) connects to organisation B ($_j$); that interaction is represented as the tie x_{ij}. An inter-organisational tie 'serve as a bond that aligns and coordinates action, enabling groups of nodes to act as a single node, often with greater capabilities' (Borgatti & Halgin, 2011, p. 7). Ties are identified in relation to a function – i.e. the content of the tie (Galaskiewicz, 1985; Tichy, Tushman, & Fombrun, 1979). The research and development (R&D) leading up to a new product and driving the formation of various alliances represents an example of a set of ties among organisations working together. A configuration of inter-organisational relationships is a graphic representation of a set of nodes connected by ties ($\sum\{x_{ij}\}$), either at a given point in time – known as a 'snapshot' – or over a period of time, which is known as longitudinal (Wasserman & Faust, 1994). The SNA have served as a 'sharper analytical tool' (Granovetter, 1973, p. 1373) for studying patterned relationships among entities, whether individuals or organisations. Prior research uses SNA to map inter-organisational relationships in a variety of industry settings, such as biotechnology (Walker et al., 1997) and building (Smyth & Pryke, 2008).

The foremost idea in the social network approach is that the structure of inter-organisational relationships constrains organisations' actions. Some unique insights are worth exploring here because of their relevance to the coordination of inter-organisational relationships:

(i) organisations develop and operate in patterned inter-organisational relationships;

(ii) a governance structure combines both economic and social aspects;

(iii) the structure of the inter-organisational relationships shapes potential actions by other organisations;

(iv) patterned inter-organisational relationships explain behaviours and consequences within organisations (i.e. collaboration outcomes).

Organisations are embedded in patterned inter-organisational relationships whose 'structure might facilitate or block organisation' (Granovetter, 1973, p. 1373). The

notion of embeddedness specifically captures the constraints of the relations on the actors, e.g. organisations (Burt, 1992; Granovetter, 1985; Nahapiet & Ghoshal, 1998; Powell, 1990; Uzzi, 1996). The embeddedness can be structural or relational. The former refers to opportunities and constraints set by the structural properties of configurations of inter-organisational relationships. Some of the relevant structural attributes are given by measures of the density and centrality of actors within the configuration of inter-organisational relationships. Density measures the frequency of ties among organisations, thus dense configurations are densely connected. Centrality is broadly the number of ties for a given organisation, thus central organisations have the highest number of ties with other parties (Freeman, 1979). Relational embeddedness refers to the impact of relationships on values and norms. The number of direct ties is often used as a measure of relational embeddedness (see Polidoro et al., 2011, for a recent example). Although, the distinction between the types of embeddedness allows for analytical clarity, the two are empirically intertwined (Nahapiet & Ghoshal, 1998; Uzzi, 1996, 1997).

The proposition of embeddedness is well-illustrated by the long-lasting debate about the impact of strong 'versus' weak ties (Burt, 1992; Coleman, 1988; Granovetter, 1973), one of the liveliest, and most inconclusive, debates in the social network literature. Strong ties are emotionally intense and involve a greater amount of time and constant interaction between the parties. By contrast, weak ties involve less time and less intensity while benefiting from new information (it avoids duplication of information). Strong ties are essential to the cohesion of the social structure (Coleman, 1988). Trust and mechanisms of social control are typical in settings where all the members know each other. Cohesion reduces the likelihood of 'free-riding' behaviours while increasing the benefits for all participants (Coleman, 1988). When studying an Italian community in Boston's West End (USA), Granovetter (1973) found that weak ties were indispensable for individuals, enabling them to obtain useful information and integrate into the community. In disagreement with most of the literature at the time, Granovetter (1973) reports that strong ties breed local cohesion (i.e. within the group) and avoid global fragmentation (i.e. across the entire network). In a specific reference to inter-organisational relationships, Granovetter (1985b) argues that organisations in densely connected networks simply do better.

Others suggest that the effects of either type of tie, strong or weak, may co-exist, with distinctive outcomes. This insight was initiated by the work of Uzzi (1996, 1997) on the 'paradox of embeddedness', based on the New York apparel industry. In another attempt to resolve this dichotomy between strong or weak ties, Mariotti and Delbridge (2012) go further by arguing that the dichotomy between 'strong' and 'weak' ties is rather narrow in its explanation. The authors subtly relax the dichotomy by arguing that organisations also rely on potential ties (essential knowledge about a possibly relevant tie) and reactivate latent ties (past ties that can readily be reactivated) (Mariotti & Delbridge, 2012, p. 14). Overall, the effect of embeddedness operates simultaneously under four tie types: strong, weak, potential, and latent. The debate about 'strong' and 'weak' ties illustrates the importance of ties among organisations to the explanation of collaboration.

Organisations operate in and develop patterned inter-organisational relationships (Dyer & Chu, 2000; Gulati & Gargiulo, 1999; Podolny & Page, 1998; Rosenkopf & Tushman, 1998; Tichy et al., 1979). For example, they are often path-dependent, due to two main factors: resources and previous experience of working together. Research informed by the resource dependence theory reports that organisations develop ties with organisations that own complementary resources (Gulati & Gargiulo, 1999; Pfeffer & Salancik, 1978). Gulati and Gargiulo (1999) conclude that resource interdependence is a strong predictor of alliance formation patterns among organisations, explaining 'where inter-organisational networks come from'. An extensive body of research reports that relationships among organisations are a primary way of organising economic activity. This is reported across several industries, in areas such as flight simulation (Rosenkopf & Tushman, 1998) and automobile manufacturing (Dyer & Chu, 2000).

Previous experience of working together is another factor that contributes to the path-dependence of inter-organisational relationships (Gulati, 1995a; Gulati & Sytch, 2008). Organisations tend to form ties with partners with which they have previous experience of working, due to the familiarity mechanism (Gulati, 1995a). Familiarity breeds trust among organisations, providing a unique relational mechanism of governance in network forms of organisation.

In contrast to prices in markets and administrative coordination in hierarchies, the governance structure in inter-organisational relationships combines both economic and social logics (Dyer & Chu, 2000; Gulati, 1995a; Nahapiet & Ghoshal, 1998;

Nooteboom, Berger, & Noorderhaven, 1997; Ring & van de Ven, 1992; Uzzi, 1996; Zajac & Olsen, 1993). Although goals of economic attainment might be enforced through binding agreements, trust among organisations is essential to enhance the coordination between them (Ring & van de Ven, 1992). Therefore, organisations, personified by boundary spanners, – that is, individuals working across organisational boundaries – foster trust-based relationships (Perrone, Zaheer, & McEvily, 2003). Trust is 'the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party' (Mayer, Davis, & Schoorman, 1995, p. 712). The assertion that individuals display a predisposition to trust is underpinned by the early works of psychologists who regard trust as that predisposition (Kramer, 1999; Rotter, 1971). Trust lubricates inter-organisational relationships by calibrating expectations and providing norms of behaviour (Gambetta, 1988). Recent literature reviews by Rousseau et al. (1998), Colquitt, Scott and LePine (2007) and McEvily (2011) establish that a consensus exists around Mayer et al.'s (1995) definition. Still, research on inter-organisational relationships frequently adopts a broader definition of trust: the goodwill of another party in a situation involving risk or vulnerability (Bigley & Pearce, 1998; Gulati, 1995a; Ring & van de Ven, 1992).

Risk and trust are related, yet distinguishable, concepts (McEvily, 2011; Uzzi, 1997). Some confusion arises as both concepts hold an element of calculativeness (Stinchcombe, 1990). The distinction hinges upon two aspects. First, the difference between risk and calculated risk depends on the theoretical perspective. Calculated risk has been defined in the TCA as a rational analysis of costs and benefits (Williamson, 1993). Thus, calculativeness is a characteristic of contract-governed, that is arm's-length, ties, as opposed to embedded ties that incorporate trust (Uzzi, 1997). Second, risk is defined as part of a subjective judgment that one organisation will perform a task in a particular situation (Ring & van de Ven, 1992).

Instead of the dichotomy of collaboration 'versus' non-collaboration typical of TCA reasoning, the risk of non-collaboration is situational. That is, organisations' engagement in collaboration varies across situations. Although collaboration is important because of interdependence among organisations, not all non-collaboration episodes accrue negative consequences. The decision to collaborate is a subjective

judgment, as found by Stinchcombe (1990) when studying decisions to collaborate made by contractors and sub-contractors working on Norwegian oil platforms.

Prior research advocates that organisations benefit from being perceived as trustworthy (Barney & Hansen, 1994; Dyer & Chu, 2000). Barney and Hansen (1994) argue that an organisation's trustworthiness – that is, being perceived as a trustworthy organisation – is a valuable source of competitive advantage because (1) it reduces the costs of transactions and (2) it helps to attract potential business partners. Furthermore, Dyer and Chu (2000) report that the trust-based relationship between Toyota and its suppliers helped it to sustain a competitive advantage over its leading rival, General Motors (GM). This relies on the premise that trust lowers transaction costs, namely, search, monitoring and enforcing. Thus, Toyota developed trustworthiness among its suppliers, resulting in lower costs of contracting and higher supplier performance, such as fewer delays.

1.4. Emerging Theoretical Perspectives

Emerging perspectives in the literature seek insights into inter-organisational relationships, either by introducing ideas from other research fields or through original research aimed at building theory. Either way, the new insights build on widely-used theories, such as those mentioned above, but incorporate a degree of critique. Some contributions highlight agency (over structure), while others pursue an understanding based on the micro-foundations of inter-organisational relationships (over macro aspects).

1.4.1. Strategic Action

Research on strategic action resonates with the debate on the relation between action and structure in social relations[8]. The leading proposition is that organisations – formed by individuals and groups – may intentionally manage social ties. This tension between structure and agency is thoroughly analysed within structuration theory under the notion of 'duality of structure' (Giddens, 1984). Duality of structure encapsulates a recursive mechanism within social structures, where structures – e.g. norms and rules – facilitate social actions, which in turn create the social structure.

[8] Although agency approaches are an established body of literature, I focus here on the key insights of agency theory that have been used within the context of inter-organisational relationships.

Agency is therefore regarded as the actions by individuals who process information about social structures triggering this recursive process. However, individuals can still deviate from the norms and rules embedded in the social structure[9].

From two quite different empirical settings, a common theme emerges: agency matters to inter-organisational networks. In the biotechnology industry, as reported by Powell, Koput and Smith-Doerr (1996), organisations in central positions in the network have rapidly implemented strategies aimed at creating new ties (i.e. alliances) with organisations that can provide R&D. This provides them with superior growth compared to their competitors. In another empirical setting, that of non-governmental organisations (NGOs) providing international aid in the Gaza Strip, research shows that the embeddedness of organisations relates to the objectives they pursue (Hardy, Phillips, & Lawrence, 2003). The organisations involved sporadically in the aid programme are those associated with strategic effects (accessing resources), while the highly embedded organisations are those associated with political effects (influence over other partners) (Hardy et al., 2003, p. 342).

Recent research sheds light upon the interplay between social structure and action in the context of inter-organisational relationships (Obstfeld, 2005; Ozcan & Eisenhardt, 2009; Santos & Eisenhardt, 2009). In a study of entrepreneurs in the US wireless gaming industry, Ozcan and Eisenhardt (2009) report that individuals actively shape network formation. This takes place through three strategies: the architectural approach, critical industry uncertainties, and the prospect of ties. Given an absence of accurate information on the inter-organisational relationships in the marketplace (i.e. interdependence and roles within the industry), entrepreneurs in the study based their action upon cognitively perceived configurations of inter-organisational relationships. In a second strategy, critical industry uncertainties lead organisations to form new ties. Entrepreneurs form new ties with organisations they perceive will help them to overcome industry uncertainties. Finally, organisations actively prospect for new ties among existing partners. Following similar reasoning, Santos and Eisenhardt (2009) report that successful entrepreneurs intentionally build

[9] Here, I aim to secure an essential understanding of structuration theory, nothing more. Further reading on structuration theory will lead to the concept of 'resources' – defined as patterns of action followed over time. I do not develop this theoretical nuance any further for two reasons: (1) it falls outside the scope of this discussion (and of this thesis); (2) it would lead to confusion with the concept of 'resources' that is defined in the resource dependence theory. Thus, the concept of 'resources' that appears elsewhere in this thesis adheres to the resource dependence theory only.

ties with established firms as part of a strategy to prevent the entry of the latter (who would use their advantageous position to take on the market).

In a study of innovation implementation within an engineering department, Obstfeld (2005) observes that the interplay between structure and action is an 'action problem'. On the one hand, dense networks promote coordination – i.e. cohesion that is sustained through norms and rules among parties (Coleman, 1994). On the other hand, novel ideas develop in sparse networks (Burt, 1992). Network structure is relevant. However, innovation in the engineering department was still found to be significantly due to individuals' orientation to act across groups – i.e. orientation towards brokerage – and to diverse social knowledge – i.e. familiarity with role-related specifications, accumulated knowledge in the firm (assessed via tenure), and education (Obstfeld, 2005, p. 100). Therefore, individual agency lies at the crossroads of accessing novel ideas (i.e. the potential to innovate) and the implementation of those ideas (i.e. innovation outcomes).

1.4.2. Micro-Foundations of Inter-Organisational Relationships

The micro-foundations of inter-organisational relationships explore behaviour among parties and its effects on the outcomes of the relationships. This approach has emerged as a counterpoint to the macro-level explanations.

The departure point is Simmel's work on third parties, or *tertius iungens* (Simmel, 1950, 1971). The key idea is that ties between two parties, that is dyads, acquire new properties whenever connected to a third party. The mechanism is that of *transitivity:* organisation A ($_i$) connects to organisation B ($_j$) (x_{ij}), organisation B ($_j$) connects to organisation C ($_l$) (x_{jl}) and organisation A ($_i$) is thus connected to organisation C ($_l$) (x_{il}). Transitive triads develop norms and social mechanisms of control at the micro-level, that is, among all three parties. Accordingly, transitivity in triads prevents the pursuit of self-interest as well as social disintegration (Krackhardt, 1998).

Triads are associated with an individual's ability to generate innovations through cross-boundary knowledge (Tortoriello & Krackhardt, 2010). A typical example of transitivity occurs when partners involved in one alliance initiate collaborations among their alliance partners (Gulati, 1995). Reciprocally connected ties promote trust and social monitoring within the alliance. Triads promote cohesion; however, triads led to group withdrawals from alliances in what is also a manifestation of cohesion (Greve, Baum, Mitsuhashi, & Rowley, 2010).

The impetus for a deeper understanding of micro-foundations stems from the study of the structural properties of inter-organisational relations in management. The concept of capability provides a good illustration[10] (Abell, Felin, & Foss, 2008). Initially understood at the organisational level, and widely adopted in the literature, capabilities represent an organisation's ability to integrate competencies (Nelson & Winter, 1982) in a routine manner. Explanations of how organisations change their capabilities, that is, dynamic capabilities, also remains primarily at the organisational level (Eisenhardt & Martin, 2000). Further research into the integration of competencies highlights the role of micro-level mechanisms. Davis and Eisenhardt (2011) find that rotating the leadership of a project among organisations has a positive impact on technological innovation in the context of inter-organisational collaboration. That is, inter-organisational ties are of critical importance to the innovation process, but not without micro-level leadership processes.

To sum up, the TCA, the resource dependence theory and the social network approach provide an essential understanding of the relevant theories used to study inter-organisational relationships. **Table 1** summarises this literature review. It shows the theoretical perspectives I used in my directed investigation of prior research on inter-organisational relationships.

[10] I call on the notion of capabilities to illustrate the relevance of research on micro-foundations (e.g. Abell et al., 2008). Capabilities provide a good example because they are often portrayed as a micro-level construction in (strategic) management, despite remaining conceptualised at a higher level. Having served to illustrate my point, at this stage no further discussion will be pursued.

Table 1 Summary of the Literature Review

Theories	Inter-organisational relationships	Length of the tie	Governance	Critiques	Purpose
Transaction Costs Approach	Transactions	'Arm's-length ties'	Contracts	Opportunistic behaviour	Profit (leading to profitability)
Resource Dependence Theory	Relations	'Arm's-length ties' and embedded ties	Contracts, power, and legitimacy	Interdependence (abuse of power)	Resources (leading to competitiveness)
Social Network Approach	Relationships/ Networks	Embedded ties (and configuration of ties)	Contracts and relational mechanisms (e.g. trust and reputation)	Structural constraints (e.g. disconnected parties)	Resources and opportunities (leading to competitiveness)
Emerging Perspectives					
Strategic Action	Relationships	Open (global structures)	'Structural duality' (e.g. agency and rules)	Agency (if instability arises)	Manoeuvring to attain goals
Micro-foundations	Relationships	Embedded (triads and global structures)	Relational (e.g. transitivity)	Overlooking of the global structure	To induce action at the micro-level

The aforementioned theories capture an evolution of the concepts used in this research, but more importantly they lay the theoretical foundations for the development of a theoretical framework that I will use to study the coordination of inter-organisational relationships, a journey that I will begin in the next chapter.

Chapter II: Theoretical Framework

Overview

My goal in this chapter is to develop a theoretical framework through which to study the coordination of inter-organisational relationships, that is, the process of purposefully aligning resources and actions among interdependent organisations. I develop a theoretical framework that builds on the TCA, resource dependence theory and the social network approach so as to unpack the theoretical underpinnings across the coordination process: antecedents, mechanisms and consequences.

One important insight – initially surprising to me – is the breadth and depth of current research that relates to the coordination of inter-organisational relationships in one way or another. Sociologists, economists and organisational theorists have developed valuable insights that unveil the multidimensionality of coordination and inter-organisational relationships (not always studied together). This provided me with the opportunity to develop a framework that integrates an eclectic body of literature (e.g. the TCA and the social network approach) that captures this multidimensionality (e.g. contractual and relational aspects), and multiple levels of analysis (e.g. the organisation, network configurations of organisations and the industry context) for each stage of the coordination process.

Having developed a theoretical framework, my assessment of the current research suggests, however, that any extrapolation regarding the coordination of inter-organisational relationships as it currently stands in the literature would be a 'leap of faith'. This is exposed by the lack of systematic research on the theoretical underpinnings of the following questions: (1) ***How are dynamic inter-organisational relationships coordinated?*** (2) ***Why do coordination problems occur in dynamic inter-organisational relationships?***

Coordination is pivotal in the theorising on inter-organisational relationships. However, the current research lacks an integrated perspective that would articulate the extensive research based on a wide array of theoretical perspectives and conducted across industry contexts. Against this backdrop, my goal in this chapter is to build a theoretical framework for the study of the coordination of inter-organisational relationships. By the end of this chapter, I will have critically evaluated the current research, as well as identified research opportunities. These two accomplishments will guide my research aimed at advancing the current theorising on the coordination of inter-organisational relationships.

2. Coordination Process of Inter-Organisational Relationships

First of all, it is crucial to underpin the notion of 'coordination' by referring to surrounding concepts often used interchangeably in prior literature: collaboration and cooperation (Ahuja, 2000a; Hardy et al., 2003). Ahuja posits that 'collaboration facilitates bringing together complementary skills [e.g. R&D capabilities] from different firms' (2000a, p. 429). Studying relationships among organisations providing international aid in the Gaza Strip, Hardy et al. (2003, p. 323) define 'collaboration as a cooperative, interorganizational relationship that is negotiated in an ongoing communicative process, and which relies on neither market nor hierarchical mechanisms of control'. The notion of collaboration is often used alongside cooperation, as shown in the above definition. However, I shall distinguish between collaboration and cooperation for the sake of conceptual clarity.

Cooperation in inter-organisational relationships[11] entails a behavioural intention to collaborate towards a common goal, given a trade-off between contributions and payoffs (Gulati & Singh, 1998; Provan & Milward, 1995). Provan and Milward (1995) use the concept of cooperation alongside coordination (mentioned implicitly) in their claim that cooperation and integration of activities across multiple organisations, are fundamental to deliver health and human services. Cooperation occurs if all parties in the inter-organisational arrangement perceive it as being fair and beneficial. Ring and van de Ven (1994, p. 94) suggest that cooperative

[11] The concept of cooperation is widely known due to the popularity of game theory. The discussion of cooperation in the light of game theory is not relevant to this thesis or my research aims. Therefore, I intentionally confine the definition of cooperation to the scope of my literature review (**Chapter I**).

relationships are 'socially contrived mechanisms for collective action, which are continually shaped and restructured by actions and symbolic interpretations of the parties involved'. For this discussion, I shall refer to cooperation as entailing behavioural intentionality, and collaboration as the willingness to jointly perform activities[12].

The fundamental components of the definition of coordination are found elsewhere in the broad literature on inter-organisational relationships (Coase, 1937; Granovetter, 1973; Gulati & Singh, 1998; Gulati et al., 2012b; Simon, 1976; Thompson, 1967; van de Ven & Gordon, 1984; Williamson, 1975). In his seminal work, Simon (1976, p. 72) defines coordination as the 'process of informing each as to the planned behaviour of the others'. Furthermore, Simon (1976) distinguishes between procedural and substantial coordination. The former delineates coordination spheres for the activities of each organisation as well as respective lines of authority. The latter provides the organisations with a specification of the tasks to be performed by each. Consider building a public school. The allocation of responsibilities (e.g. the main contractor for all building works) and leadership (e.g. client pursuing on-time completion) refers to procedural coordination. Detailed allocation of the tasks among the organisations in the project documentation show substantial coordination.

The variety of definitions of coordination echoes elements of the market, hierarchies and network forms of organisation (**Chapter I**). The variety reflects the breadth and depth of prior research on coordination and inter-organisational relationships (not always studied together). For transaction costs researchers, coordination is a conscious direction taken in organising physical, financial and human capital and workloads in order to deliver goods or services (Coase, 1937; Williamson, 1979). Williamson (1991) argues that coordination refers to actions intended to foster the adaptation of organisations to unanticipated disturbances while protecting them from misappropriation by other parties to the transaction. The ultimate purpose of organisations is profit, achieved by selling products and services. Consequently, organisations actively endeavour to integrate their tasks and goals harmoniously and internally in order to compete in the marketplace. Because

[12] Although I find this distinction helpful, a consensual distinction between cooperation and collaboration is yet to emerge (and that is a topic of research on its own). Prior research often uses the two concepts interchangeably but I have observed a pattern based on the theoretical frameworks used. Coordination is consistently used in game theory research and collaboration in multi-party research (e.g. inter-agency collaboration).

individual goals are interdependent but not necessarily aligned, they need to be managed in order to avoid conflict between the organisations (i.e. parties) involved in the transaction (Langlois & Robertson, 1993).

An often-debated feature of coordination is the notion of coordination costs. These encompass 'activities to be completed jointly or individually across organisational boundaries and the related extent of communication and decisions that would be necessary'[13] to do so (Gulati & Singh, 1998, p. 782). Coordination costs have implications for organisations' profit goals insofar as the rents from economic activity decrease as the costs of organising increase (Coase, 1937). Communication and governance structures therefore become essential in attaining coordination. Contracts are the primary mechanisms used to promote coordination; however, they are costly. Less costly options are therefore appealing to organisations.

With a focus on the intra- and inter-organisational scope of action, Thompson (1967) suggests that coordination refers to the effective and efficient regulation of the interdependence between units or organisations. As for the intersection between the hierarchical and network forms, Argote (1982, p. 423) states that 'coordination involves fitting together the activities of organization members, and the need for it arises from the interdependent nature of the activities that organization members perform'. Organising within organisations is well-documented in some of the foundational work on the theory of the firm (Cyert & March, 1963; Simon, 1962).

In a literature review of inter-organisational relationships, Smith, Carroll and Ashford (1995, p. 11) specifically note that 'coordination concerns the combination of parts to achieve the most effective or harmonious results'. Coordinated action requires that organisations work together to attain a common goal since the actions of one organisation shape another's possibilities for action. Recalling the example of building a school, the main contractors are required to coordinate with the architects and engineering firms in order to finalise the drawings[14]. Similar observations about the integration of tasks performed by different organisations can be made in other settings, such as hospitals (Gittell & Weiss, 2004), software production (Camerer &

[13] Although I am interested in the coordination of inter-organisational relations, it is not the purpose of this thesis to study coordination costs in the strict sense as conceptualised within the TCA. That would have required an exclusive focus on the agency problems that occur throughout transactions. My approach is rather aligned with the management literature that adopts a broader view. This is thought to be more relevant to studying the alignment of inter-organisational relationships from a network perspective (this was first noted by Gulati and Singh [1998, p. 782]).

[14] I acknowledge that collaboration between the architect and main contractors varies based on the tendering arrangement and, of course, across projects.

Knez, 1996) and R&D (Teece, 1986). In the same vein, the integration of parties has been the focus of studies on the mobilisation of local communities (Granovetter, 1973), health care organisations (van de Ven & Gordon, 1984) and mergers and acquisitions (M&As) (Puranam, Singh, & Zollo, 2006).

In a study of M&A processes, Puranam et al. (2006, p. 264) suggest that acquirers exploit the innovation potential of acquired firms in a 'coordinated manner by linking them [innovation streams of the acquired firm] to their own complementary assets in manufacturing, and distribution'. This definition makes it clear that several parties are involved. However, the notion of interdependence acquires a pivotal place when one searches for other definitions of coordination. Others posit that 'coordination is the extent to which organizations attempt to ensure that their activities take into account those of other organizations' (Hall, Clark, Giordano, Johnson, & Roekel, 1977). These two conceptualisations of coordination show that coordination entails a joint effort among organisations to attain a purpose.

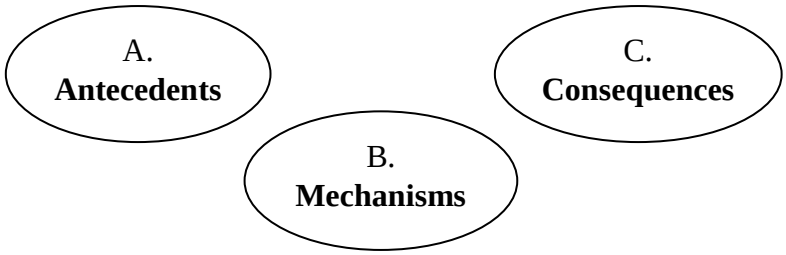
It is important to note that coordination among organisations is not specific to privately owned organisations, as shown by research on governmental agencies (Provan & Milward, 1995; van de Ven & Gordon, 1984) and NGOs (Hardy et al., 2003). Van de Ven and Gordon (1984, p. 598) suggest that the coordination of inter-organisational relationships is the pursuit of 'a particular objective for which it [the organisation] must gain support, cooperation, or resources from a number of other organizations'. This definition sheds light on the role of legitimacy in explaining coordination among organisations; furthermore, this view conveys a sociologically grounded approach that complements the TCA (Jones, Hesterly, & Borgatti, 1997; Ring & van de Ven, 1994). Organisations might decide to coordinate with government agencies to legitimise their projects (e.g. charity fundraising). Government agencies have a legally-endorsed legitimate right to demand action from other organisations (e.g. the issuing of planning permissions by local councils).

Moving towards an inclusive definition – unrelated to the type of organisation – coordination 'involves a select, persistent, and structured set of autonomous firms (as well as non-profit organisations) engaging in creating products or services based on implicit and open-ended contracts' (Jones et al., 1997, p. 914). These authors explicitly integrate non-profit and for-profit organisations while contrasting organisational autonomy with task interdependence.

Some aspects emerge from previous definitions that could help us to create an inclusive definition of the coordination of inter-organisational relationships, namely, task and resource interdependence, structure, legitimacy, parties (i.e. at least two organisations; *N>2*) and purpose. Coordination of inter-organisational relationships can be understood as a social action system: (1) 'behaviour among members is aimed at attaining collective and self-interest goals'; (2) 'interdependent processes emerge through the division of tasks and functions among members'; (3) 'an IR [inter-organisational relation] can act as a unit and has a unique identity separate from its members' (van de Ven, 1976, p. 25). The convergence of elements for a working definition of coordination of inter-organisational relations is perhaps better captured by Mark Granovetter. While doing ethnographic work with the Italian community in Boston's West End, he was intrigued by 'why some communities organize for common goals easily and effectively whereas others seem unable to mobilize resources, even against dire threats' (Granovetter, 1973, p. 1373).

In this thesis, I define **coordination of inter-organisational relationships as a process of purposefully aligning resources and actions among interdependent organisations**[15]. This definition is inclusive enough to encompass the richness of theoretical perspectives and yet provides the conceptual elements for a theoretical framework that reflects the multiple facets of coordination. Following a process view (van de Ven & Gordon, 1984), I shall organise the development of my theoretical frameworks around antecedents, mechanisms and consequences (**Figure 2**).

Figure 2 Stylised Representation of the Coordination Process



I have shown the importance of establishing an inclusive definition of coordination before developing a theoretical framework. The study of coordination

[15] A recent theoretical conceptualisation of coordination – 'joint pursuit of agreed-on goals in a manner corresponding to a shared understanding about contributions and payoffs' (Gulati et al., 2012, p. 533) – supports the definition adopted here.

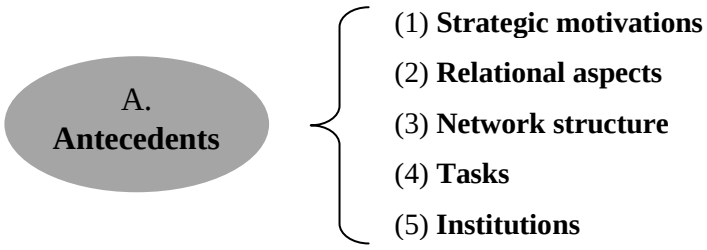
benefits from various research strands and I have formulated a definition of the coordination of inter-organisational relationships that captures the diversity of perspectives.

Before I proceed to develop a theoretical framework for my study, it is important to outline the underlying methodology used in this exercise. First, and following a process view, I argue that the study of the coordination of inter-organisational relationships should be understood in terms of antecedents, mechanisms and consequences. For each of these stages, I unpack the multifaceted aspects of the coordination process (e.g. formalised and relational aspects) across multiple levels of analysis (e.g. organisations [$_i$ and $_j$], ties [x_{ij}], network configuration [$\sum\{x_{ij}\}$] of organisations and the industry context). I start by analysing the antecedents.

2.1. Antecedents

Antecedents[16] are the motivations and inducements that initiate coordination among organisations. Often, strategy literature uses the term 'initial conditions' to refer to the objectives of the partners, adeptness at learning and industry context (Doz, 1998; Gulati, 1998). Still, inter-organisational arrangements extend beyond business-like relations and include coordination among, for example, governmental agencies (van de Ven et al., 1984). I shall adopt a definition of antecedents that includes 'initial conditions' and other relevant aspects that trigger the coordination of inter-organisational relationships. The current literature leads me to the following: strategic motivations, relational aspects, network structure, the nature of the tasks, and institutions (**Figure 3**).

Figure 3 Summary of Antecedents



[16] The antecedents of phenomena within social networks are often confusing because causes and outcomes (i.e. endogeneity) are difficult to distinguish. I shall argue, at this stage, that my aim is to review aspects that have been reported in the prior literature to be the antecedents of coordination of inter-organisational relations.

(1) **Strategic motivations** explain why individual organisations establish ties with other organisations; they are set at the organisational level (every organisation has different strategic motivations). The resource dependence theory advocates that organisations deliberately seek resources across inter-organisational boundaries.

Scholars have proposed[17] two views in the search for resources: complementarity and similarity. One organisation's search for resources aims to complement its own resources with new ones available from other organisations. Ozcan and Eisenhardt (2009) find that complementarity of resources drives tie formations in the wireless gaming industry, where complementarity is argued to lead to high performance. An alternative logic suggests that organisations initiate coordination with organisations with similar resources (i.e. similarity encourages coordination) (Saxton, 1997). Gulati (1998) shows that organisations form alliances (i.e. a particular case of inter-organisational coordination) with partners with similar resources. These similar resources can take several different types, such as financial' R&D capabilities' information' knowledge' entry into new markets and legitimacy and status (**Table 2**).

Financial resources activate coordination across organisational boundaries (e.g. venture capitalists). The main thesis is that organisations form ties with counterparties to access financial resources (DiMaggio, 1992; Galaskiewicz, Bielefeld, & Dowell, 2006). In an example about the foundation of the Museum of Modern Art in New York City, DiMaggio (1992) argues that the founders of the museum formed several ties among their already-existing network to collect financial endowments. Furthermore, Galaskiewicz et al. (2006) find that non-profit organisations that draw heavily on contributions and volunteers grow at a faster rate if they have more ties to urban elites; however, non-profits that depend on fees and/or sales grow faster if they have few ties.

R&D capabilities are also among the antecedents of the coordination of inter-organisational relationships, as illustrated by technology-driven ventures. In a study of entrepreneurial firms, Eisenhardt and Schoonhoven (1996) show that the formation of alliances among organisations is guided by the goal of accessing novel

[17] Over three decades on from the initial work by Pfeffer and Salancik (1978), scholars are still debating the implications of diversity, which echoes the debate on complementarity versus similarity. (In 2011, The Academy of Management Journal organised a call for papers on 'Relational Pluralism of Individuals, Teams, and Organizations', with Ranjay Gulati, Martin Kilduff, Stan Li, Andrew Shipilov and Wenpin Tsai as guest editors. This initiative shows the interest from a large community of scholars in progressing the topic from its current mixed findings.)

technology, in successful cases leading to new products. Prior research provides compelling evidence on new product development as a trigger of coordination across organisational boundaries. Building upon this argument, other scholars emphasise that organisations seek a broader array of R&D capabilities – a pattern that is well-documented among biotechnology firms (Baum et al., 2000; Cox, Mowatt, & Prevezer, 2002b; Powell, Koput, & Smith-Doerr, 1996). The argument is that organisations with robust R&D capabilities quickly become the coordinators of multiple ties with other organisations (Powell et al., 1996; Rosenkopf & Tushman, 1998). R&D capabilities are the 'admission ticket' for inter-organisational ties based on information shared among organisations (Powell et al., 1996, p. 138). This is illustrated by the UK's frozen food industry, in which retailers rely on coordination with their suppliers to integrate large departments of new product development (owned by UK retailers) with manufacturing facilities (owned by suppliers) (Cox et al., 2002b). Coordination among retailers and suppliers allows for swift responses to market trends due to information sharing among the parties (**Table 2**).

Information is essential for coordinating actions across organisational boundaries (Burt, 1992; Levinthal & Fichman, 1988; Stinchcombe, 1990; van de Ven, 1976; Walker et al., 1997). One important type of information is referrals. Information referrals are recommendations about organisations to work with, on the basis of either previous experience of working together or their reputation in the marketplace (Gulati & Gargiulo, 1999). Individuals also experience substantial benefits through referrals. Burt (1992) suggests that financial analysts who get frequent referrals experience higher financial returns because being referred in multiple settings creates opportunities (e.g. to work with other organisations). The source of information is important, though. Levinthal and Fichman (1988) find that organisations may change auditors based on the reputation and influence of the auditor. Other researchers have explored the role of information about an organisation's background in the decision to form a venture with it (Stinchcombe, 1990; van de Ven, 1976; Walker et al., 1997). Organisations seek information about the capabilities and behaviour of potential partners (Walker et al., 1997). Information on the behaviour of potential partners is essential in deciding upon the governance structure whenever there are concerns regarding the misappropriation of resources.

Information conveys knowledge that helps organisations to operate in the market, and is especially important in dynamic environments (Bourgeois & Eisenhardt,

1988). Knowledge access and processing is a crucial part of organisations' activity as it influences their ability to observe and exploit information (Cohen & Levinthal, 1990; Cyert & March, 1963). Developing the necessary knowledge is a time-consuming and expensive strategy for organisations (Kogut & Zander, 1992). Therefore, they develop coordinated action outside firm boundaries in a quest for knowledge that is readily available within their counterparts (Hitt, Hoskisson, Johnson, & Moesel, 1996; Sapienza, Autio, George, & Zahra, 2006).

Entry into new markets often requires legitimacy in the marketplace, that is, appearing aligned with the prevailing norms and rules (DiMaggio, 1992; Nohria, 1992; Schermerhorn & Shirland, 1981). Although the possibility of accessing new markets is strategically appealing to organisations, new entrants cannot succeed without access to relevant information about the markets. Legitimacy is crucial to success (even more so, if organisations have no history of market operations) (**Table 2**). Organisations' legitimacy in the marketplace is often understood as a strategic motivation to create inter-organisational ties. Studying cooperation among hospitals, Schermerhorn and Shirland (1981) posit that coordination among the directors of hospitals increases as they become concerned about hospital autonomy and image in their inter-organisational relationships.

Status also embodies a strategic motivation to form and coordinate inter-organisational ties (Baum, Rowley, Shipilov, & Chuang, 2003; Benjamin & Podolny, 1999; Gulati & Gargiulo, 1999; Hallen, 2008; Levinthal & Fichman, 1988; Podolny, 1993b). Building on the example of the auditing firms, Levinthal and Fichman (1988) show that organisations seek status (i.e. an unqualified opinion rather than a qualified opinion) when choosing to start a collaboration (or switch collaboration ties). Researchers often operationalise status into two dimensions: an organisation's past performance and its institutional affiliations (Podolny, 1993). The premise is that an organisation's status is also related to that of their affiliates. Thus, the lower the status of an organisation's affiliates, the lower is its own status (and *vice versa*). As a result, organisations tend to form ties with other organisations of a similar status – which is known as status symmetry (Baum, Rowley, Shipilov, & Chuang, 2003; Gulati & Gargiulo, 1999). Providing another perspective, research has also conceptualised status in terms of inter-organisational network position[18] (Gulati &

[18] Network centrality is used by Gulati et al. (1999, p. 1448) as a measure of status. This is complementary to other research that focused on an organisation's past performance.

Gargiulo, 1999; Hallen, 2008). Organisations in central positions tend to choose collaboration partners that are equally central (Gulati & Gargiulo, 1999

In sum, strategic motivations refer to organisations' search for resources that initiate coordination. Relational aspects also lead to coordination, as I explain next.

(2) **Relational aspects** refer to interactions that occur prior to the start of coordination among organisations. I argue that relational aspects include the following: previous experience of working together (familiarity), success of previous ventures, personal relationships and common third parties (**Table 2**).

Organisations with previous experience of working together (familiarity) develop *stronger* inter-organisational ties. Gulati (1995a) reports that repeated ties are a strong predictor of future alliance formation because organisations develop trust-enhanced coordination mechanisms. The familiarity proposition posits that behavioural predictability based on previous experience predicts the organisation's willingness to perform interdependent activities across organisational boundaries. Familiarity fosters ties because it reduces the risk of resource misappropriation and uncertainty: partners' behavioural predictability is informed by past experiences. Familiarity might refer to both past and ongoing collaboration (in the case of multiple projects; this is the case in project-based industries). Organisations with a track record of alliances form more alliances. Reputation and visibility in the marketplace, developed through alliances, trigger new opportunities for future alliances (Gulati & Gargiulo, 1999; Powell et al., 1996). Furthermore, past ties are important under market uncertainty. Knowing about the partner, and the success of prior ventures, create an appealing proposition for an organisation by reducing the costs of searching for new partners. Podolny (1994) shows that investment bankers tend to interact with those with whom they have interacted in the past. In the biotechnology industry, with a constant demand for novel knowledge, embeddedness is a critical predictor of future ties (Walker et al., 1997).

The success of previous business ventures offers a complementary – or often competing – explanation for coordination among organisations (**Table 2**). The proponents of familiarity (Gulati, 1995a; Gulati & Sytch, 2008) have lately advised caution on the role of previous experience, on the grounds that organisations mostly form ties with organisations with whom they have jointly achieved *successful* ventures. Organisations choose to form ties with previous partners – from past or

ongoing partnerships – for reasons of behavioural predictability but no less importantly because of the success of prior ventures (Gulati et al., 2011b).

Nevertheless, organisations must also initiate coordinated actions with new partners, with whom they have no past or ongoing partnering experience. Collaborations can also start because of common third parties (Greve et al., 2010; Gulati, 1995a; Gulati & Gargiulo, 1999; Rowley, Behrens, & Krackhardt, 2000). Current partners provide referrals regarding potential partners, increasing the partners' behavioural predictability (Rowley et al., 2000).

Personal relationships can also be responsible for new inter-organisational collaborations (**Table 2**). Research on interlocks[19] suggests that ties among firms' directors predict future alliances (Beckman, Haunschild, & Phillips, 2004; Davis, 1991; Rosenkopf & Schleicher, 2008). Interlocks of directors influence the diffusion of information about both organisations and industry practices (Davis, 1991). As for alliance formation, directors sitting on the boards of several organisations become influential at the start of collaborations among organisations that were previously disconnected. Rosenkopf and Schleicher (2008) find that interlocks facilitate alliance formation if the common director serves as an officer in one of the firms.

The background of the boundary spanners also influences the initiation of coordination among organisations. Attributes such as nationality, ethnic group and personal affinity complement the strategic motivations discussed above. Recent research that applies matching theory to entrepreneurship studies highlights the importance of ethnic groups in matching potential partners in starting up a business venture (Mitsuhashi & Greve, 2009; Vissa, 2011). Vissa (2011) reports that social similarity – notably, social caste – explains tie formation among Indian entrepreneurs. In his study of the Museum of Modern Art, DiMaggio (1992) shows that personal affinity becomes more of a determinant in 'upper class' social settings.

In sum, relational aspects deal with the prior ties among organisations, referrals and personal ties among managers (i.e. boundary spanners) and their backgrounds. These relational aspects lead us to explore further the premise that the structure of ties among organisations matters for coordination.

[19] Corporate directors who simultaneously sit on the boards of more than one corporation.

Table 2 Antecedents of Inter-Organisational Relationships Coordination

Antecedents	Relationship with coordination	Theoretical reasoning on antecedents	Empirical and theoretical evidence on antecedents	Examples
1. Strategic motivations - Resource complementarity/ similarity - Financial resources - R&D capabilities - Information - Knowledge access - Entry to new markets (new clients) - Status - Legitimacy	**Nodes** ($_i$ and $_j$) •	Organisations engage in coordination across organisational boundaries to access complementary (or because of) similar resources. Financial resources, R&D capabilities, information, knowledge, entry to new markets, legitimacy and status are antecedents of the coordination of inter-organisational relationships	(Baum et al., 2000; Benjamin & Podolny, 1999; Bourgeois & Eisenhardt, 1988; Burt, 1992; Cohen & Levinthal, 1990; Cox et al., 2002b; Cyert & March, 1963; DiMaggio, 1992; Eisenhardt & Schoonhoven, 1996; Galaskiewicz et al., 2006; Gulati & Gargiulo, 1999; Hallen, 2008; Katila et al., 2008; Kogut & Zander, 1992; Nohria, 1992; Podolny, 1993a; Podolny, 1993b; Powell et al., 1996; Ring & van de Ven, 1992; Rosenkopf & Tushman, 1998; Sapienza et al., 2006; Schermerhorn & Shirland, 1981; van de Ven & Gordon, 1984; Walker et al., 1997)	* Entrepreneurs who seek financial resources from established organisations; * Biotechnology firms that form alliances with other organisations with R&D capabilities; *Relationships between retailers and suppliers in the UK's frozen food industry; * Entry into new markets via joint ventures; * 'De novo' organisations that seek in 'incumbent' organisations a source of legitimacy and status for their operations.
2. Relational aspects - Previous experience of working together (familiarity) - Success of previous collaborations - Common third parties - Personal relationships - Background of boundary spanners	**Ties** (x_{ij}) •-•	Previous experience of working together (specifically in successful ventures) promotes coordination among organisations; embedded personal relations and background elements are also essential.	(Barkema et al., 1997; Beckman et al., 2004; Davis, 1991; DiMaggio, 1992; Doz, 1996; Greve et al., 2010; Gulati, 1995a; Gulati & Gargiulo, 1999; Gulati & Sytch, 2008; Gulati et al., 2011b; Mitsuhashi & Greve, 2009; Podolny, 1994; Powell et al., 1996; Rosenkopf & Schleicher, 2008; Rowley et al., 2000; Vissa, 2011; Walker et al., 1997)	* Biotechnology organisations that have worked together tend to form future alliances; * Organisations in an alliance are likely to initiate coordination in the presence of common third parties; * Formation of ties among Indian entrepreneurs from the same social caste; * Founders of the Museum of Modern Art in New York, who created ties based on personal affinity in order to collect donations.

(Table continues on next page)

3. Network structure - Structure (dense versus sparse) - Organisation's initial position (central versus peripheral)	**Configuration** $(\sum\{x_{ij}\})$ 	The whole structure (dense versus sparse) and organisations' structural position in the various configurations of inter-organisational relationships affect the start of coordination.	(Ahuja, 2000a; Burt, 1992; Chung, Singh, & Lee, 2000; Doz, 1996; Gulati, 1995b; Gulati & Gargiulo, 1999; Hallen, 2008; Podolny, 1994; Powell et al., 1996; Rosenkopf & Tushman, 1998; Walker et al., 1997)	* Organisations in densely connected configurations have a better likelihood of coordinating; * Firms in central positions receive more requests for coordination across organisational boundaries; * Entrepreneurs trigger coordination with peripheral organisations (in search of novel resources).
4. Tasks - Anticipated task interdependence - Uncertainty and complexity of the task	**Purpose** $(\sum\{x_{ij}\})\rightarrow Y$ where Y_a refers to goal a	Task type encompasses anticipated interdependence and task-related uncertainty (e.g. task complexity), which leads organisations to coordinate.	(Beckman et al., 2004; Bensaou & Anderson, 1999; Casciaro, 2003; Durkheim, 1984; Gulati & Singh, 1998; Kogut & Zander, 1996; Pfeffer & Salancik, 1978; Rosenkopf & Tushman, 1998; Teece, 1986; Thompson, 1967)	* Organisations seek other organisations to collaborate with based on anticipated interdependence; * When supplier-buyers perceive high task-related uncertainty they develop new ties aimed at coordination.
5. Institutions - 'Macro-culture' - Industry-targeted policies - Legal and regulatory mandates	**Context**	Industry structures have values and norms, policies, and legal and regulatory mandates embedded in them. These shape an organisation's likelihood to begin coordinating with other organisations.	(Abrahamson & Fombrun, 1994; Baum & Oliver, 1991; DiMaggio & Powell, 1983; Eisenhardt & Bourgeois, 1988; Galbraight 1977; Grandori & Soda, 1995; Hall et al., 1977; Oliver, 1990; Osborn & Hagedoorn, 1997; Pfeffer & Salancik, 1978; Provan & Milward, 1995; Simon, 1962; Thompson, 1967; van de Ven & Gordon, 1984; van de Ven, Walker, & Liston, 1979)	* Setting up a new enterprise requires new coordination ties with industry regulators; * 'Green economy' regulation is leading organisations to coordinate with other parties to source new products and techniques; * Legal and regulatory mandates prescribe necessary coordination concerning planning and delivery of childcare programmes;

(3) **Network structure**[20] relates to the structure of ties; an organisation's position shapes its possibilities for coordination. Configurations might consist of densely or sparsely connected organisations. While 'strategic motivations' are endogenous (inherent to individual organisations), network structures are exogenous (inherent in the structural properties). The relevance of network structure as an antecedent of coordination occurs at two levels: the whole structure (dense versus sparse) and the organisation's structural position (central versus peripheral).

Network structures influence how organisations come to know about each other (i.e. about each other's capabilities) (Walker et al., 1997). Dense configurations – multiple ties among organisations – lead to the coordination of inter-organisational relationships through the richness and fluidity of information available. Organisations progressively stockpile a repertoire of information and knowledge about other organisations that can be consulted at any time (Gulati, 1995b; Gulati & Gargiulo, 1999). Closeness breeds trust and social control mechanisms that foster behavioural predictability in new coordination ventures. Because, in dense structures, organisations are highly interconnected, they entail lower costs of searching for new partners (compared to the marketplace). Alternatively, brokerage behaviour creates opportunities to initiate coordination across inter-organisational boundaries (Burt, 1992). Sparse networks provide greater opportunities for brokers because the organisations are connected around subsets rather than the whole network. This pattern is common among ventures aiming to pursue innovation, for example technology alliances (Ahuja, 2000a) and entrepreneurs (Hallen, 2008).

An organisation's initial position in the network configuration affects its likelihood of starting a new coordination with other organisations (Hallen, 2008; Walker et al., 1997). Centrality is perceived as a form of network status relating to reliability and the capability to coordinate inter-organisational relationships (Powell et al., 1996). Central organisations choose to form ties with other organisations that are equally centrally located. This strategy is driven by concerns over reputation and the misappropriation of resources (Chung et al., 2000; Gulati & Gargiulo, 1999; Podolny, 1994). Because centrality embodies reputation, it operates as a social monitoring mechanism insofar as central organisations attempt to prevent potential reputation damage disseminating across the inter-organisational network (Gulati & Gargiulo, 1999). Furthermore, the

[20] I use the term 'network structure' interchangeably with 'network configuration'.

proponents of this idea argue that organisations in central positions also receive more requests to start collaborating than do organisations at the structural periphery (Ahuja, 2000b; Gulati & Gargiulo, 1999; Powell et al., 1996). Organisations located at the periphery experience less substantial informational benefits in terms of frequency and accuracy of information flow. Information is pivotal for organisations to learn about potential collaborators and their reputations regarding partnering behaviour (Ahuja, 2000b). It is also important in updating organisations on technological directions, which is a proxy for foreseeing demands for interdependence (Rosenkopf & Tushman, 1998).

In sum, the network structure is a relevant antecedent of coordination insofar as the configuration of ties affects how organisations get to know about each other. Centrality is also a signal of quality for potential partners, and the position in the network affects an organisation's access to information. Notwithstanding this, task-related interdependence among organisations also matters; after all, coordination requires the integration of tasks toward a common goal (**Table 2**).

(4) **Tasks** are a key antecedent of the coordination of inter-organisational relationships. The main driver of task interdependence is the 'division of labour' among organisations (Durkheim, 1984; [1893]). Similarly to societies, which are organised around roles and professions (Durkheim, 1984), organisations split their work into several tasks, controlled by autonomous organisations. Yet, the breakdown of tasks into sub-tasks brings substantial uncertainty, as organisations become progressively dependent on other organisations (Pfeffer & Salancik, 1978; Thompson, 1967).

Anticipated task interdependence[21] and task uncertainty are fundamental elements of the coordination of inter-organisational relationships. The integration of tasks performed among autonomous organisations is often planned (i.e. anticipated) through a form of 'template'. Thompson (1967, pp. 54-64) suggests three types of interdependence: pooled, sequential and reciprocal. Interdependence is pooled if each party contributes and each party is supported by the whole. Sequential interdependence refers to situations in which the actions of organisations are arrayed serially, such that the action of one organisation leads to the possibility of action by another organisation

[21] Regarding the antecedents of coordinated inter-organisational ties, organisations form ties based upon assumptions about anticipated interdependence. A similar argument is proposed in Gulati et al. (1998) and van de Ven and Gordon (1984). Nonetheless, I fully acknowledge the theoretical proposition that most, as some authors would argue, of the tasks performed across inter-organisational boundaries cannot be entirely anticipated.

(like a chained process). Finally, reciprocal interdependence is an intense process that entails the exchange of outputs among the parties.

Task-related uncertainty – the unpredictability of the elements that compose the task – shapes the willingness (or requirement) to coordinate inter-organisational relationships (**Table 2**). Each task encompasses a specific degree of uncertainty (e.g. risks to the harmonious integration of tasks across autonomous organisations[22]) based on endogenous and exogenous causes. Endogenous task uncertainty is intrinsically related to the nature of the tasks, as shown by technology collaborations and alliances. When an alliance is pursuing an invention (e.g. a new pharmaceutical product), the tasks entail a certain degree of uncertainty due to their novelty. One way to overcome such uncertainty is to coordinate with other organisations with experience of dealing with various aspects of the task. Additionally, tasks vary in complexity: the more components, the more complex is the task. The various elements of task uncertainty affect the initiation of inter-organisational coordination. In the buyer-supplier relationship among US and Japanese car makers, Bensaou and Anderson (1999) report that perceived task-related uncertainty led to the development of new ties and the implementation of mechanisms aimed at coordination. Casciaro (2003) too suggests that task-related uncertainty predicts coordination among organisations.

Exogenous sources of uncertainty include, for example, technological change or even shocks (Teece, 1986). Under these conditions, organisations seek to coordinate their actions with other organisations in order to reduce task uncertainty. Some authors conclude that technology and inter-organisational networks are mutual influences. As an initial condition, technology shapes how organisations coordinate and react in the marketplace (Ansari & Phillips, 2011; Maurer & Ebers, 2006; Rosenkopf & Tushman, 1998). A trade-off emerges between task uncertainty and inter-organisational ties: to reduce task uncertainty, organisations split tasks outside boundaries; however, this increases the external dependence of organisations (Pfeffer & Salancik, 1978). Thus, the integration of tasks becomes more difficult as organisations' activities spread across autonomous organisations (Beckman et al., 2004) (**Table 2**).

Overall, tasks are antecedents of coordination insofar as organisations are increasingly task-dependent on other organisations in a process that stems from the

[22] Task interdependence and task uncertainty are intertwined concepts. Highly interdependent tasks encompass a high degree of task uncertainty. However, task uncertainty is inherent to the 'task' itself (performed by a single organisation), while task interdependence is fundamentally a relational attribute between at least two parties performing a task.

'division of labour' in the marketplace. Thus far, I have discussed nodes (i and j), ties (x_{ij}) and network configuration ($\sum\{x_{ij}\}$). However, the antecedents of coordination are also often related to institutional aspects.

(5) **Institutions** are the legal, economic and social environment in which organisations operate. The industry environment can be seen in the foundational research on inter-organisational relationships (Eisenhardt & Bourgeois, 1988; Pfeffer & Salancik, 1978). Research has looked at the culture of the industry ('macroculture'), industry policies, and organisations with legal and regulatory mandates.

In a review of the research on inter-organisational relationships, Oliver (1990, p. 243) classifies legal and regulatory requirements as drivers of necessity. These are the cases whereby inter-organisational relationships are mandated by government (Baum & Oliver, 1991; Grandori & Soda, 1995; Provan & Milward, 1995; van de Ven & Gordon, 1984). Legal and regulatory requirements set rules and norms that foster (or constrain[23]) the inception of ties across organisations (**Table 2**).

Industries have idiosyncratic beliefs known as 'macrocultures' (Abrahamson & Fombrun, 1994; Ansari & Phillips, 2011; DiMaggio, 1992; Lawrence, Hardy, & Phillips, 2002). 'Macrocultures' are important for understanding the antecedents of coordination because they induce expectations for task-related collaboration (Abrahamson & Fombrun, 1994, p. 728). Furthermore, the roles of different organisations are defined within 'macrocultures' (Bechky, 2006; Hardy, Lawrence, & Grant, 2005). A further insight is given by the work of DiMaggio and Powell (1983) on institutional change (at a macro-level). The authors craft the notion of the 'organisational field', which specifically encapsulates suppliers, regulatory bodies, and most significantly, the set of expectations, norms, values and socially constructed realities. As an antecedent of coordination, 'macrocultures' provide strong guidance on the ties that must be formed in order to accomplish a given task. However, non-organised and dispersed groups in the industry can also trigger change that forces organisations coordinate with one another in order to address it, for example, new market demands. This is illustrated by the development of text messaging, which was

[23] A case where legal and regulatory requirements constrain inter-organisational ties is the anti-trust law, for example by stopping companies from forming alliances that would lead to a market monopoly, that is a market dominated by a single company. In 2007, the European Commission required the cessation of a joint venture between Bertelsmann (an international media corporation based in Germany) and AOL/Time Warner (two media and entertainment companies that have operated separately since late 2009).

due to the diffusion of new practices by consumers rather than an initative by organisations (see Ansari & Phillips, 2011).

Industry-directed policies indirectly shape the inception of inter-organisational coordination. Osborn and Hagedoorn (1997) suggest that the creation of alliances and the decision to coordinate are embedded in a larger institutional setting. Policies sustain and shape the possibility of inter-organisational ties. A typical case where an incoming policy affects (i.e. triggers or constrains) the coordination of inter-organisational relationships is that of the widespread 'green economy' regulations. Organisations initiate a wide array of collaborations in order to source new products and techniques and comply with newly enforced regulations. The recently introduced UK policy aimed at reducing carbon emissions in new homes has caused main contractors to seek new partnerships in a quest for alternative materials and building techniques.

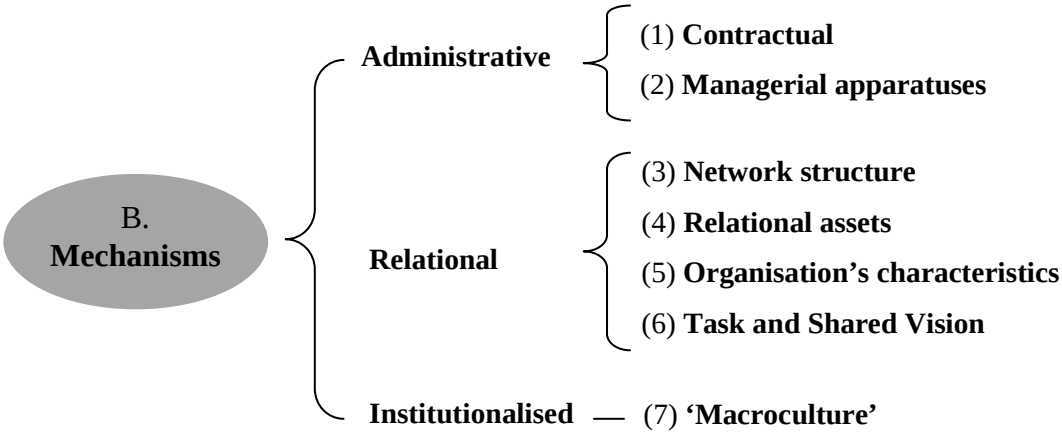
Thus far, I have gathered together the current literature on the antecedents of the coordination of inter-organisational relationships. Next, I explore the mechanisms underlying this coordination.

2.2. Mechanisms

The mechanisms used to coordinate inter-organisational relationships are the engine of the coordination process. I consider three analytically motivated[24] types of coordination mechanisms: administrative, relational and institutional (as shown in **Figure 4**). Administrative mechanisms resonate with the literature on contractual arrangements and managerial intervention in inter-organisational relationships and differ from relational mechanisms that stress socially embedded aspects (e.g. trust, power and social monitoring). Institutional refers to how the institutional environment acts as a coordination mechanism. Altogether, these three mechanisms encompass our current understanding on the coordination of inter-organisational relationships.

[24] Although empirically related, the mechanisms of inter-organisational relationship coordination are analytically difficult to separate. I proceed in this fashion for clarity's sake. I do not suggest an empirical demarcation among the mechanisms.

Figure 4 Summary of Mechanisms



2.2.1. Administrative

Administrative mechanisms[25] are implemented through formal procedures and intended to support the coordination of inter-organisational relationships (Larson, 1992, p. 78). I include contracts and managerial apparatuses as administrative mechanisms of coordination. Similar labels are employed elsewhere in the literature, such as bureaucratic forms of networks, which are 'coordination modes formalised in contractual agreements' (Grandori & Soda, 1995, p. 201).

(1) **Contracts** are the foremost form of administrative mechanism used to coordinate inter-organisational relationships (Grandori, 1997a; Williamson, 1979). Any form of contractual arrangement induces coordination through relevant provisions. Macaulay (1963, p. 3) posits that contractual arrangements are relationships based on a device (i.e., contract) that includes rational planning with provisions and sanctions regarding performance. The relevance of contracts to the coordination of inter-organisational relationships may be understood through the distinction between 'structuration' and 'structure' (Giddens, 1976). 'Structuration' is the actual process of action and interaction that is contextually situated, while 'structure' refers to patterns of interactions that are recognisable by the parties. Contracts contribute to the 'structuration' process, whose outcomes are a structure of interactions among

[25] At this point, it is important to clarify that the literature on strategy often refers to 'structure' as the formalised aspects of inter-organisational relationships (see Ring & van de Ven, 1994). I use the term 'administrative' to avoid confusion with the notion of 'structure' that I borrow from the SNA and refer to the set of ties among organisations. Therefore, in this study, I shall use the terms 'administrative aspects' and 'structure' to ensure conceptual clarity while remaining 'true' to the theoretical underpinnings. Furthermore, the label 'administrative' allows me to consider the literature on both contracts and managerial interventions, which have rarely benefited from integration.

organisations. Alliances (Gulati, 1998; Jarillo, 1995), joint ventures (Barkema et al., 1997; Zajac & Olsen, 1993), and federations of organisations (Provan & Milward, 1995; van de Ven & Gordon, 1984) are all examples of contractual arrangements aimed at coordination among organisations.

Contracting lies at the heart of economics (Coase, 1937), occupying a pivotal place in the transaction costs literature (Ouchi, 1980; Williamson, 1979). Primarily, contractual arrangements are enforced in order to develop a 'congruence of goals' among the parties (Ouchi, 1980). Congruence is important given that one organisation's goals do not necessarily coincide with those of partner organisations. A typical case is seen in technology alliances, where logics of 'competition' and 'cooperation' might coexist. Gomes-Casseres (1996, p. 6) emphasises that alliances are 'loose collections of firms with disparate interests and capabilities'.

Since organisations might have divergent motivations and objectives, contracts aim to secure a consensus on the specific means and ends of coordination (van de Ven, 1976). The content of the contract fosters the alignment of the organisations' interests while creating safeguards against appropriation concerns and behavioural uncertainty (Gulati & Singh, 1998; Macaulay, 1963; Ring & van de Ven, 1992). Two defining aspects of the contents of contracts are incentive systems and authority (Ariño & Torre, 1998). An incentive system refers to a set of rewards and sanctions intended to promote compliance with the contractual terms (i.e. obligations and expectations) (Grandori, 1997b). The incentive system is set up according to the loss (or risk of loss) that would be caused should the parties fail to coordinate (Gulati, 1995a). A reward that is often used in strategic alliances is share equity; organisations share the returns according to the resources they have contributed (**Table 3**).

Lines of authority specify the leadership in the coordination process (Camerer & Knez, 1996). Authority confers organisations with a mutually agreed scope to deliberate over the actions of other organisations (and the enforcement of the incentive system). Disputes are disruptive and their resolution is as critical to the sustainability of inter-organisational relationships as it is complex to address (Malhotra & Lumineau, 2011). Overall, contracts are binding agreements that are enforced so as to develop coordination. Another type of administrative aspects is managerial apparatuses.

(2) **Managerial apparatuses** are mundane coordination mechanisms aimed at coordination, such as managerial mandates, plans and schedules. Managerial mandates refer to the introduction of third parties whose role is to coordinate the inter-

organisational relationship. The underlying reasoning draws on triads (Simmel, 1950), by using separate coordinators and integrators (i.e. *tertius gaedens*) of tasks developed elsewhere by autonomous organisations. Establishing bridges[26] among organisations that are otherwise disconnected is the immediate motivation behind bringing in third parties that act as coordinators. Third parties matter as a mechanism of coordination of inter-organisational relationships because they provide the following benefits: they act as bridging organisations, they provide bargaining power in the relationship, they build trust and they aid information flow. These parties may be contracted in (e.g. consulting firms) or take part voluntarily (e.g. local agencies). A typical case of third-party coordination is that of consultant firms' projects (Levinthal & Fichman, 1988). Alternatively, some organisations may voluntarily engage in bridging behaviours. Human and Provan (1997) highlight the role of agencies acting as brokers in the development of coordination among manufacturing enterprises in the US wood products industry. Moreover, organisations are driven to develop coordination amongst themselves. Van de Ven et al. (1979, p. 31) note that some agencies – in a regional network of agencies in the US – constantly assumed a 'common mandate of planning and coordination'. The underlying motivations are diverse; however, leadership through brokerage behaviour often is a source of power (**Table 3**).

That is, bargaining power is acquired through the intermediary position. In a classic example, third parties are in a position of power simply due to the 'divide and rule' aphorism, as they can access information on both sides, and may bargain one against another. For example, a client acting as an intermediary may be able to bargain with two suppliers of the same product (i.e. substitutes)[27]. Although there is an underlying assumption of 'tension' in the role of the third party, they are often employed to prevent (or resolve) conflicts of interests that, once raised, could disrupt coordination among organisations. Brokerage mediates tension under conditions of uncertainty and control, but no organisation has absolute authority over the whole network configuration.

[26] Establishing bridges fits with Burt's Theory of Structural Holes (1992) on brokerage behaviour. However, a distinction needs to be made. In Burt's work (1992), brokerage is primarily conceptualised as an individual's intentional behaviour (e.g. entrepreneurs) charged with agency and free of any institutionalised incentive other than perceptions of access to information and opportunities. Here, I review prior research that deals with third parties that are intentionally – and voluntarily – brought in. Brokerage might be affected by an individual's own will. Although the consequences of brokerage by third-party organisations as a mechanism of inter-organisational relationships coordination may be similar, the inducement process is different.

[27] Negotiating power is greater if two parties are supplying the same (or substitute) products because the suppliers enter into direct competition, which benefits the buyer (lower prices or better conditions).

Third parties are often regarded as 'neutral intermediaries' whose function is to lubricate the coordination of inter-organisational relationships (Shapiro, 1987; Zucker, 1986). The perception of 'neutrality' attached to intermediaries in inter-organisational relationships leverages aspects of trust. A reputation for being trustworthy is important for the effectiveness of ventures across organisational boundaries (Perrone et al., 2003; Tushman, 1977). Third parties shape the access and flow of information across these boundaries. Information flow is important for sustaining the coordination of inter-organisational relationships because the actions of organisations – and the successful integration of tasks – depend on accurate and up-to-date information (Cyert & March, 1963). Information becomes even more important when inter-organisational activities are affected by a high degree of uncertainty, whether task- or environment-related (Galbraight 1977). Organisations then deploy *ad hoc* mechanisms to enhance the coordination of inter-organisational relationships.

Plans and schedules, such as *Gantt* charts[28], are institutionalised routines that operate as mechanisms of inter-organisational relationship coordination (Argote, 1982; Gittell & Weiss, 2004; Grandori, 1997b; Simon, 1976; van de Ven, 1976). Because of the specialisation of work ('the division of labour'), 'procedures must be introduced to secure coordination among the members of the group; and among the most powerful of coordination procedures is the centralization of decisions' (Simon, 1976, p. 238). Prior research has devoted a great amount of effort to detailing the 'bureaucratic'[29] elements of inter-organisational relationship coordination. Planning and control systems are observable across several industries.

In a literature review on inter-firm coordination modes, Grandori (1997b) argues that the building industry is a typical case of the wide use of inter-organisational planning, mutual control systems, and *Gantt* charts. Another example is found within the health sector, where rules and authority arrangements are also part of the managerial apparatuses of coordination among hospitals (Argote, 1982). A similar use of plans and schedules is employed to coordinate relationships within federations of organisations (van de Ven, 1976). Managerial apparatuses foster coordination based on assumptions of anticipated interdependence among organisations.

[28] These are graphic representations of the expected workload, with an allocation of tasks to different organisations. *Gantt* charts also establish milestones throughout the process that can be used for monitoring purposes.

[29] Some authors use a broad category of 'programmed means of achieving coordination' to include plans, meetings, project-based collaboration agreements, rules and authority arrangements (Argote, 1982). I shall focus on plans and meetings as the key elements of coordination (Grandori, 1997).

Table 3 Mechanisms for Inter-Organisational Relationships Coordination

	Mechanisms	Relationship with coordination	Theoretical reasoning on mechanisms	Empirical and theoretical evidence on mechanisms	Examples
Administrative	**1. Contractual** - Contracts - Governance structure and content of the contract	**Nodes** ($_i$ and $_j$) • --------- **Ties** (x_{ij}) •-•	Contracts subtly shape the structure of inter-organisational relationships; the content of the contract (i.e. incentive systems and lines of authority) lay the foundations for coordination.	(Barkema et al., 1997; Camerer & Knez, 1996; Coase, 1937; DiMaggio, 1992; Giddens, 1976; Gomes-Casseres, 1996; Grandori, 1997a; Grandori, 1997b; Gulati, 1995a; Gulati, 1998; Gulati & Singh, 1998; Jarillo, 1995; Larson, 1992; Lazerson, 1988; Macaulay, 1963; Malhotra & Lumineau, 2011; Ouchi, 1980; Ring & van de Ven, 1992; van de Ven, 1976; van De Ven, Delbecq, & Koenig, 1976; Williamson, 1979; Zajac & Olsen, 1993)	* Alliances and joint ventures develop from specific contractual arrangements; * Coordination is driven by incentives (e.g. shared equity or a share of sales in the case of new product development).
	2. Managerial apparatuses - Management mandates (third-party) - Plans and schedules	**Nodes** ($_i$ and $_j$) • --------- **Ties** (x_{ij}) •-•	Management apparatuses develop the coordination of inter-organisational relationships by setting shared expectations and obligations, progressively harmonised through intermediaries and ordinary plans and schedules.	(Argote, 1982; Cyert & March, 1963; Galaskiewicz, 1985; Galbraight 1977; Gittell & Weiss, 2004; Grandori, 1997b; Gulati, 1998; Human & Provan, 1997; Levinthal & Fichman, 1988; Perrone et al., 2003; Shapiro, 1987; Simmel, 1950; Simon, 1976; Tushman, 1977; van de Ven, 1976; van de Ven et al., 1979; Zucker, 1986)	* Management consultants working on projects (e.g. building projects); * Plans and scheduled interactions among organisations over time; * *Gantt* charts with task allocation and milestones agreed among organisations.
Relational	**3. Network structure** - Dense versus sparse - Position - Arm's-length versus embedded ties - Activity - Sanctions (reputation)	**Configuration** ($\sum\{x_{ij}\}$) 	Dense configurations and organisations that are centrally located are essential mechanisms of inter-organisational relationships.	(Burt, 1992; Coleman, 1988; DiMaggio, 1992; Gargiulo & Benassi, 2000; Granovetter, 1985; Gulati & Gargiulo, 1999; Hansen, 1999; Hargadon & Sutton, 1997; Krackhardt, 1990; Nahapiet & Ghoshal, 1998; Ozcan & Eisenhardt, 2009; Powell, 1990; Reagans & McEvily, 2003; Rowley et al., 2000; van de Ven, 1976; Walker et al., 1997)	* Entrepreneurs in central positions develop more accurate cognitive structures of the whole configuration, which leads to the effective coordination of resources; * In the creation of the Museum of Modern Art in New York, the founders' centrality was critical to their developing an 'awareness' of resources.

(Table continues on next page)

Relational (cont.)	**4. Relational assets** - Trust - Reputation - Sanctions (further business)	**Ties** (x_{ij}) ●-●	Trust is a coordination mechanism that is independent of, yet complementary to, contracts. It is less costly and enforced by the social mechanisms of trustworthiness, reputation and relational-based sanctions.	(Barney & Hansen, 1994; Das & Teng, 1998; Dyer & Singh, 1998; Gambetta, 1988; Gulati, 1995a; Gulati, 1998; Macaulay, 1963; MacDuffie, 2011; Madhok, 1995; Malhotra & Lumineau, 2011; McEvily, 2011; McEvily, Perrone, & Zaheer, 2003; Perrone et al., 2003; Simon, 1976; Williamson, 1996; Zaheer & Venkatraman, 1995; Zajac & Olsen, 1993) (Baker, Gibbons, & Murphy, 2002; Barney & Hansen, 1994; Burt, 1992; Burt & Knez, 1995; Granovetter, 1985; Gulati & Gargiulo, 1999; Gulati, Nohria, & Zaheer, 2000; Larson, 1992; Powell et al., 1996; Ring & van de Ven, 1992)	* Organisations often rely on informal means to address problems rather than a comprehensive reading of contractual clauses; * Biotechnology firms rely on trust-based coordination to achieve responsiveness (i.e. a high innovation rate) in a highly dynamic industry.
	5. Organisations' characteristics - Learning capabilities - Similarity of organisations	**Nodes** ($_i$ and $_j$) ●	Organisations have different coordination capabilities based on learning capabilities – via routines and inter-organisational interaction – and similarity (primarily capability-based) to other organisations that are part of the same configuration of inter-organisational relationships.	(Barkema et al., 1997; Baum et al., 2000; Bingham & Davis, 2012; Cohen & Levinthal, 1990; DiMaggio & Powell, 1983; Doz, 1996; Eisenhardt & Martin, 2000; Gomes-Casseres, 1996; Gulati & Gargiulo, 1999; Gulati et al., 2000; Hallen, 2008; Hansen, 1999; Kogut & Zander, 1996; Larson, 1992; Levinthal & Fichman, 1988; McPherson & Smith-Lovin, 1987; Mitsuhashi & Greve, 2009; Nelson & Winter, 1982; Penrose, 1959; Sytch & Gulati, 2012; van de Ven, 1976; van de Ven & Gordon, 1984; Zollo & Winter, 2002)	* Strategic alliances that develop learning capabilities in each organisation are more successful at coordinating operations over time; * Organisations that are similar rely on a common understanding of the industry in order to coordinate with one another; * Differences in capabilities between organisations promote coordination.

(Table continues in next page)

	6. Tasks and shared vision - Task uncertainty and novelty - Shared strategy and mission (about the purpose of the inter-organisational arrangement)	**Purpose** $(\sum\{x_{ij}\}) \rightarrow Y$ whereas Y_a refers to goal *a*	Low task-related uncertainty and shared vision – *consensus* creation – facilitate the coordination of inter-organisational relationships.	(Argote, 1982; Bensaou & Anderson, 1999; Casciaro, 2003; Provan & Milward, 1995; Ring & van de Ven, 1992; Santos & Eisenhardt, 2009; Thompson, 1967; van de Ven, 1976; van de Ven & Gordon, 1984)	* New ventures involve a high degree of task uncertainty; * Multi-agency arrangements and entrepreneurs are typical cases of coordination relying on a shared vision among the parties (contracts might not be in place).
Institutional	**7. 'Macroculture'** - Practices (industry standards) - Norms and rules - Roles	**Context**	Industries are characterised by specific practices, norms, rules and roles that affect inter-organisational coordination, such as preferences for the use of administrative mechanisms, shaping the interactions among organisations and role-driven relationships.	(Abrahamson & Fombrun, 1994; Baum et al., 2000; DiMaggio, 1992; Durkheim, 1984; Eccles, 1981; Grandori & Soda, 1995; Holm, 1995; Jones et al., 1997; Kogut & Zander, 1996; Olsen, 1978; Powell et al., 1996; Puranam et al., 2006; Ring & van de Ven, 1992; Stinchcombe, 1985a)	* By contrast to the building industry's contractual complexity, biotechnology organisations tend to engage in contract-relaxed inter-organisational relationships; * In the Norwegian fisheries, inter-organisational relationships comprise socially defined norms of collaboration practices (e.g. patterns of information).

Here, I have shown that administrative mechanisms of coordination entail contractual arrangements and managerial apparatuses. These aspects form a well-established strand of research that builds primarily on the TCA. Researchers have highlighted that coordination mechanisms are also underpinned by relational mechanisms, such as goodwill, trust among organisations and organisational characteristics. These two views still fuel some of the most enduring debates in the literature.

2.2.2. Relational

Relational mechanisms encapsulate coordination-enhancing aspects that are broadly defined in prior research as 'informal agreements sustained by the value of future relationships and prevalent within and between organisations' (Baker et al., 2002, p. 39). Unlike administrative mechanisms, relational aspects relate to, for instance, the network structure and trust-based ties. Relational mechanisms are related to the embeddedness perspective within social network theory (Barney & Hansen, 1994; Gulati, 1995a; Nooteboom et al., 1997; Uzzi, 1997) (**Table 3**).

(3) **Network structure** relates to coordination mechanisms in several ways, namely fluidity of information, structural position, and the awareness of resources. The main proposition in this regard posits that the possibilities for coordination are constrained by the structural features of inter-organisational relationships because structure affects resources (e.g. information) essential for coordination.

Dense networks mean that the organisations ($_i$ and $_j$) in the network ($\sum\{x_{ij}\}$) are highly connected. In sparse networks, organisations ($_i$ and $_j$) form groups or subsets – also known as 'cliques' – that are relatively disconnected. Prior research posits that coordination is primarily a feature of cohesive networks[30]. The structure of inter-organisational relationships operates by constraining or enhancing coordination. Cohesive ties constitute 'channels through which partners can learn about the competencies and the reliability of the other' (Gulati & Gargiulo, 1999, p. 1446). Information flows between organisations and thus affects the coordination process.

[30] Originally, insights on the implications of sparse versus dense networks were developed at the individual level, as in the Italian community in Boston's West End (Granovetter, 1973) and among stock traders (Burt, 1992). Recently, this reasoning has been more widely implemented in organisational-level research (e.g. alliances among firms) (Burt et al., 1995; Gulati et al., 1999; Powell et al., 1996; Walker et al., 1997).

A cohesive network reduces uncertainty because organisations develop more accurate behavioural expectations about their partners (Burt & Knez, 1995). Shared norms and values allow organisations to develop coordination mechanisms (Powell, 1990; Walker et al., 1997). However, the coordination of inter-organisational relationships often requires information from parties that are sparsely connected. A typical example is given by technology collaborations in which organisations need to find and combine resources from parties that were previously disconnected (Owen-Smith & Powell, 2004; Prevezer, 2001). The importance of accessing information that is lodged in disconnected – or indirect – parties is thoroughly discussed in Burt's theory of structural holes (1992).

From a coordination perspective, the main advantage of participating in networks stems from accessing novel information that would otherwise be inaccessible. In contrast to the argument concerning cohesiveness (Coleman, 1988; Granovetter, 1985), sparse networks become pivotal in strengthening inter-organisational coordination by linking parties that were previously disconnected. Moreover, sparse networks are more efficient because they have fewer redundant ties – that is, ties conducting similar information (Rowley et al., 2000). The absence of redundant ties means that a specific role is ascribed to each tie and organisation (**Table 3**).

Recent research comparing strong ties (abundant in dense configurations) and weak ties (abundant in sparse configurations) points out implications for information processing (Hansen, 1999; Reagans & McEvily, 2003). Hansen (1999) finds that the transfer of complex and tacit knowledge is a function of strong ties enhanced by shared norms and trust. Weak ties depict superior information fluidity across organisations. However, it tends to be fairly practical information and knowledge, that is, codified or explicit knowledge (Hansen, 1999). Furthermore, Reagans and McEvily (2003) untangle the effect of tie strength and network configurations: the structure and range of configurations of relationships ease knowledge transfer 'over and above the effect for the strength of the tie'. Strong ties facilitate the transfer of tacit knowledge, as organisations tap into different expertise across the network.

An organisation's centrality in the configuration of inter-organisational relationships is an important factor in achieving coordination. Firstly, centrality positively affects the quality of information an organisation obtains[31]. Accurate

[31] For clarity' sake, I must stress a distinction between the impacts of 'network structure' and 'network position' regarding information. 'Network structure' – that is whether the ties are dense or

information flows through central network positions while ‘second-hand information is often fuzzy and inaccurate’ for organisations in the periphery (Burt, 1992, p. 14). Because structurally central organisations access information from several organisations, they benefit from information that is relevant to their coordination of other organisations located in the periphery.

However, organisations in the periphery may establish bridges to other organisations. This allows organisations to reorganise information and resources that are available elsewhere in the configuration of inter-organisational relationships (Hargadon & Sutton, 1997). In an Italian subsidiary of an international computer firm, Gargiulo and Benassi (2000) found that if managers’ networks were dense, it hindered their possibility of responding to requests caused by changes in task-related interdependence. The authors conclude that managers in highly dense networks are ‘trapped in their own net’; in other words, the failure to coordinate was greater because of a lack of ability to adjust (Gargiulo & Benassi, 2000, p. 192). Organisations that are centrally located are greatly exposed to reputation damage because they are densely connected to many organisations (Gulati & Singh, 1998).

Second, the position in the inter-organisational network not only grants access to accurate information, it also makes the organisation’s perception of the whole structure of inter-organisational relationships more accurate. The linkage between centrality and the accuracy of the perceived network structure has been shown to be decisive in the coordination of actions among parties (Krackhardt, 1990; Ozcan & Eisenhardt, 2009). In studying entrepreneurs in the US wireless gaming industry, Ozcan and Eisenhardt (2009) found that they relied heavily on mental representations of the whole structure of inter-organisational relationships. Entrepreneurs’ strategies for gathering resources reflected the structure of inter-organisational ties as they perceived it. Greater accuracy in these perceptions led to more effective actions being taken. In another study, of a small entrepreneurial firm based in the Silicon

---

sparse – affects the information flow among organisations, while ‘network position’ primarily affects the quality of that information (Burt, 1992; Granovetter, 1985; Gulati & Gargiulo, 1999; Hansen, 1999; Krackhardt, 1990; Walker et al., 1997). For example, consider the development of a novel technology by a research consortium of several companies and a specific episode of miscommunication regarding the integration of a component. Now, this might occur because of a disrupted information flow among the organisations regarding the technical specificities (i.e. compatibility requirements), which is typically the case with sparse network structures. Alternatively, it might occur because of misinformation being passed between the project leaders (i.e. the central organisation) and a third-party developer (i.e. a peripheral organisation). Although both cases are intrinsically related, there is one difference: ‘network structure’ and ‘network position’ impact differently on the information.

Valley, Krackhardt (1990) claims that accuracy in the perception of the inter-organisational network mobilises power itself. Here, the argument is that power is induced through access to information flows in the informal network (Krackhardt, 1990). These two studies suggest that the accuracy of the perception of the configuration – which is shaped by one's position in it – positively affects the possibility of coordination (**Table 3**).

Finally, central organisations develop 'awareness' about the resources that can be obtained, as well as those needed by counterparts (van de Ven, 1976). 'Awareness' suggests how organisations learn about the reliability, status and power of other parties (DiMaggio, 1992, p. 125). In the example of the Museum of Modern Art, the founders' awareness of the resources within their personal network was critical to making the museum possible (against predictions by outsiders) (DiMaggio, 1992).

The study of network configuration offers a preliminary insight into the relational mechanisms of coordination. However, structural features are insufficient to secure an understanding of the unfolding process of coordination, which leads me now to explore the intersection between network structure and relational assets.

(4) **Relational assets** are lubricators of the coordination of inter-organisational relationships – such as trust – that induce lower costs of coordination (**Table 3**). Similarly to the debates on strong versus weak ties, and dense and sparse configurations, the debate on the role of relational forms of governance is ongoing (MacDuffie, 2011; Malhotra & Lumineau, 2011; McEvily, 2011). The debate about the role of trust, which has engaged many scholars across fields of research, has led to various insights into the coordination among organisations.

Contractual arrangements and trust-based ties are often regarded as two polar opposite forms of coordinating inter-organisational relationships. One perspective, led by transaction costs economics, is that trust is, at best, a sub-category of risk (Williamson, 1996). Any argument made in favour of trust can be regarded as yet another reason to enforce contractual arrangements. Flexibility and incompleteness of contracts harms the alignment and congruence of goals among organisations

The counter-argument is suggested by scholars who support a 'relational' view of inter-organisational relationships (Barney & Hansen, 1994; Das & Teng, 1998; Dyer & Singh, 1998; Gulati, 1995a; Madhok, 1995; McEvily et al., 2003; Zaheer & Venkatraman, 1995). They argue that organisations pursue their own 'strategic motivations', but not necessarily in an opportunistic way because they are aware of

the value creation that occurs through relationships (Dyer & Singh, 1998; Zajac & Olsen, 1993). Trust in inter-organisational ties enhances the development of common understandings, which in turn lead to behavioural predictability. This can occur despite the absence of formal governance mechanisms – or at least when they are reduced" (Das & Teng, 1998; Zaheer & Venkatraman, 1995). The role trust plays in coordination across organisational boundaries is asserted by Gulati (1998, p. 304): 'interfirm trust is an extraordinary lubricant for alliances that involve considerable interdependence and task coordination between partners'. A similar proposition is argued by Madhok (1995), who advocates for joint ventures to shift from ownership to trust-based governance structures.

However, the claim that trust lubricates inter-organisational relationships has evolved into another rather vibrant debate: is trust a substitute or a complement for contracts? Some authors suggest that trust can substitute for formal agreements (Gambetta, 1988; Poppo & Zenger, 2002). Trust-based ties themselves are mechanisms that align organisations in the pursuit of common goals. Citing a manager of a Wisconsin-based manufacture, Macaulay (1963, p. 61) offers an account of the relationship between contracts and trust: 'If something comes up, you get the other man on the telephone and deal with the problem. You don't read legalistic contract clauses at each other if you ever want to do business again.' This remark shows the prevalence of relational aspects over contractual ones (**Table 3**).

A substantial amount of research suggests the presence of a continuum between contracts and trust in a recursive fashion – whereby trust influences contractual arrangements and *vice versa*. For instance, Herbert Simon asserted that 'authority [contractual aspects], unless buttressed by other forms of influence, is relatively impotent to control decisions in any but a negative way'[32] (Simon, 1976, p. 227). The complementarity between contractual arrangements and trust in inter-organisational ties is shown in Perrone et al. (2003). The authors conclude that organisational environments with a lower degree of control over their actions (discretion) foster to higher levels of trust among boundary spanners.

[32] A sociology-grounded stream of research pointed out the role of the social structure (Coleman, 1988a; DiMaggio et al., 1983; Granovetter, 1973), at the same time that another group of researchers was actively pushing forward a theory of transaction costs (Eccles, 1981; Williamson, 1979; 1981; 1993) in which contracts were given a central function to prevent misappropriation and misalignment in inter-organisational relations. To some extent, this section inherits this debate that is still widely embedded in today's research efforts, as is shown elsewhere in this thesis.

The complementarity between trust- and contract-based mechanisms of coordination can be demonstrated by looking at the underlying social triggers of coordination. Unlike contract-based mechanisms, in which authority and sanctions are enforced, trust-based coordination operates primarily on the basis of trustworthiness, reputation and relational-driven sanctions. Being perceived as trustworthy by the other parties is important not only for organisations' competitiveness (Barney & Hansen, 1994), but also as a mechanism to coordinate inter-organisational relationships. Perceived reliability and competence affect other organisations' willingness to be in a situation of interdependence with (i.e. transfer power to) the focal organisation. Trustworthiness accelerates the formation of ties – because trustworthiness conveys information about organisational capabilities – while reducing coordination costs (e.g. search and contracting costs). Thus, the concern for coordination is 'not if you trust, but who do you trust?' (Burt, 1992).

Reputation refers, for example, to an organisation's compliance with norms and rules (Ring & van de Ven, 1992). Reputational concerns drive the coordination of inter-organisational relationships (Granovetter, 1985; Gulati et al., 2000) by promoting 'enforceable' or 'deterrent-based' trust (Burt & Knez, 1995). Deterrent-based trust facilitates coordination because organisations align their interests to prevent the malfeasance of inter-organisational relationships. In an extreme case, organisations may apply relational-based sanctions to other organisations if a transgression has occurred. Restrictions on future business are often used to inflict sanctions on other organisations (Gulati & Gargiulo, 1999; Larson, 1992).

In summary, the sustainability of inter-organisational relationships relies heavily on trust regardless of the presence of administrative controls. The biotechnology industry provides a relevant example, where trust alongside contracts forms the basis of inter-organisational coordination, which is critical to innovation in highly dynamic industries. Not only does trust enhance coordination; it also promotes learning. As Powell et al. (1996, p. 117) note, 'a lack of trust between the parties, difficulties in relinquishing control, the complexity of a joint project, and differential ability to learn new skills are all barriers to effective collaboration'.

(5) **Organisations' characteristics** are attributes intrinsic to individual organisations that shape the possibility of coordination across boundaries. In a study of entrepreneurs, Larson (1992, p. 99) notes that 'not all firms seek or are capable of engaging in such in-depth coordination and collaborative activities'. This is the

premise for this section. In it, I identify the relevance of the following characteristics of organisations: learning capabilities and the similarity of organisations (**Table 3**).

Organisational ties are not sufficient to develop inter-organisational coordination; the capabilities (e.g. technical expertise) of the organisations are fundamental in underpinning coordination across organisational boundaries (Eisenhardt & Martin, 2000; Fuchs & Garicano, 2011; Nelson & Winter, 1982; Penrose, 1959). Recall the example of the biotechnology industry. Powell et al. (1996) show that ties among organisations are important but learning capabilities play a defining role in coordinating inter-organisational relationships. Furthermore, 'learning is developed socially through the formation of values and convergent expectations', which facilitate coordinated action over time (Kogut & Zander, 1996, p. 506). Like trust, learning unfolds as a process in which organisations engage in feedback cycles (Ariño & Torre, 1998; Doz, 1996). An organisation's learning capability enhances coordination at the inter-organisational network level because organisations progressively develop adaptive flexibility and the willingness to make commitments. Doz (1996) argues that organisational learning capabilities are decisive in ensuring that strategic alliances experience success, that is, achieve the purpose of the alliance.

Similarity[33] among organisations is defined in reference to characteristics such as expertise and capabilities (Gulati & Gargiulo, 1999), status (Hallen, 2008), markets (Baum et al., 2000) and country (Barkema et al., 1997). Expertise and capabilities are the most relevant aspects of similarity, as far as the coordination of inter-organisational relationships is concerned. Similarity of organisational expertise influences the dynamics of coordination insofar as it defines how much one organisation knows about another (Mitsuhashi & Greve, 2009).

Organisations that have little in common are less likely to initiate communication. Van de Ven and Gordon (1984, p. 601) state that 'organisations with moderately similar professional skills, clients, and services represent a common culture of shared meanings, which facilitates communication'. Organisations operating in similar organisational fields develop, for example, common heuristics in information (Hansen, 1999) and knowledge-sharing practices (Kogut & Zander, 1996).

[33] In the sub-section on 'Strategic Motivations' (Section 2 – 'Antecedents of Inter-Organisational Relationship Coordination'), I argued that similarity contributed to the ignition of coordination. Here, I return to the discussion on similarity versus complementarity to assess the implications for the mechanisms used to coordinate inter-organisational relationships, that is, to what extent similarity and complementarity affect the unfolding of coordination.

Nonetheless, expertise-specific heuristics constrain information-sharing processes among other members located in distant parts of the network.

(6) **Task uncertainty and a shared vision** are fundamental to the process of coordination (**Table 3**). Task uncertainty increases organisations' propensity to use rules and programmes aimed at developing coordination.

A high level of task-related uncertainty brings greater challenges for task integration, regardless of the coordination-enhancing mechanisms (e.g. managerial apparatuses) that organisations may introduce. This is particularly critical as organisations rely more and more on an inter-organisational 'division of labour' (Kogut & Zander, 1996). Where task-related uncertainty is low, organisations develop 'pattern maintenance activities' that ease inter-organisational coordination (van de Ven & Gordon, 1984). However, if tasks lead to high levels of uncertainty, coordination across organisations becomes more important. Joint actions among organisations are particularly necessary if the uncertainty is linked to the novelty of the venture (Ring & van de Ven, 1992). In this case, the organisations must share a vision in order to achieve their purpose.

A shared vision provides the basis for a 'consensus' among the organisations within the inter-organisational network configuration. Consensus refers to 'the degree to which an organization's specific goals and services are agreed upon by the parties' (van de Ven, 1976, p. 31). Interaction among organisations enhances the development of shared goals and knowledge, which in turn help to consolidate the other mechanisms of coordination. Specifically, communication channels ensure that all parties get feedback on the suitability of their actions within the project. Communication, referrals and personal acquaintances solidify consensus around the purpose of coordination (van de Ven, 1976).

Once organisations reach a consensus, coordination among the parties is facilitated by the development of congruence of goals. The notion of goal congruence stresses the possibility of organisations having individually different goals that are, nevertheless, compatible with a common purpose, leading to the 'goal-congruence mode of coordination' (van de Ven & Gordon, 1984). Essentially, this suggests that organisations may pursue their individual goals without compromising the attainment of the purpose of the inter-organisational network. Oliver (1990, p. 250) argues that 'the greater the degree of domain consensus among or between public sector or social service organisations, the higher the probability that these

organisations will establish relations'. The lack of a shared vision and a common understanding of the contributions by and payoffs to each organisation lead to dialectic tensions about key aspects – e.g. trust and vigilance, and control and autonomy – that underpin the collaboration process (de Rond & Bouchikhi, 2004).

Two examples of entrepreneurship and multi-party collaborations illustrate the importance of a shared vision to developing inter-organisational coordination. Entrepreneurs have to assemble resources from other organisations (e.g. venture capitalists), which may not take part if they do not share the vision (i.e. regarding the potential success of the project). A particular case of this occurs in nascent markets where organisations' operations incur risks due to the emerging nature of the market (Santos & Eisenhardt, 2009). Another example is multi-agency arrangements, that is long-term commitments to deliver programmes. Here, a shared vision is important as some parties might be tempted to defend their own interests (Provan & Milward, 1995). In both examples, a shared vision ensures a sense of 'sameness' where administrative coordination mechanisms may not exist (or may not be implicit).

In summary, relational mechanisms of coordination are concerned with relational assets (e.g. goodwill trust), the organisations' characteristics, and task uncertainty and a shared vision among organisations. Relational mechanisms shed light on the sociological and organisational theories that underpin the coordination of inter-organisational relationships. The last dimension of coordination mechanisms I explore concerns institutional aspects.

2.2.3. Institutional

These are macro-level aspects institutionalised and embedded at the industry level. I shall draw on the notion of macroculture (**Table 3**).

(7) **'Macroculture'** encapsulates industry-related aspects that are likely to shape the mechanisms of coordination of inter-organisational relationships (Abrahamson & Fombrun, 1994; DiMaggio, 1992; Grandori & Soda, 1995). First, research consistently stresses that industry's preferences for contractual arrangements are uneven, as the contrast between the building (Eccles, 1981; Stinchcombe, 1985a) and biotechnology (Baum et al., 2000; Powell et al., 1996) industries shows. For instance, the building industry relies heavily on sub-contracting practices – the main contractors form contracts directly with several specialist contractors (Eccles, 1981). Sub-contracting is a form of contract; yet it has distinctive coordination-related

implications compared to traditional contracts. While traditional contracts are made between two parties and clearly state the obligations and expectations, in sub-contracting there is a mix of formal aspects and flexibility regarding the interdependences across the inter-organisational network in different phases, for example regarding the duration of the building project (Stinchcombe, 1985a). Sub-contracting arrangements are also used for the coordination of inter-organisational relationships in the fashion clothing and content (e.g. film) industries (Jones et al., 1997). There is little use of contracts in dynamic industries whose need for inter-organisational coordination fluctuates constantly.

Norms and rules embedded at the institutional level affect how organisations operate (Ansari & Phillips, 2011; Kogut & Zander, 1996; Lawrence et al., 2002; Ring & van de Ven, 1992). Institutions define roles and norms that shape how organisations relate to one another. From a sociological perspective, the work of Durkheim (1984; [1893]) laid the foundations for our understanding of societal relationships as being organised around roles. In his notion of 'organic solidarity', (Durkheim, 1984; [1893]) argues that individuals relate to society based upon their roles. From a narrower perspective, scholars discuss the implications of role on coordination-related aspects. DiMaggio (1992) argues that an important element of institutional aspects is that they ascribe roles to organisations, that is, institutions entail a 'classification criteria'. Furthermore, these roles attach expectations and obligations to organisations in terms of coordination among parties, for example through role-based coordination (Bechky, 2006).

Institutionalised roles present specific implications for the coordination of inter-organisational relationships because knowledge and information become codified according to those roles (Holm, 1995; Olsen, 1978). Kogut and Zander (1996) claim that knowledge is encoded in the structuring of the work. One way in which roles shape coordination is by developing conventions and a common language, known as cross-understanding (Puranam et al., 2006), where conventions and rules define how individuals coordinate their behaviour (Kogut & Zander, 1996, p. 506). It is reasonable to say that 'common definitions of situations produce similar actions' (Olsen, 1978, p. 106). For instance, Holm (1995) reports that relationships among Norwegian fisheries comprise an element of social construction regarding how to collaborate, resolve technical problems and patterns of information (**Table 3**).

Having reviewed and discussed the antecedents and mechanisms, I shall complete the process view on the coordination of inter-organisational relationships by examining their consequences. These relate to the attainment of a common goal – as suggested in the definition of coordination that underlies this theoretical framework.

2.3. Consequences

Organisations do not coordinate for coordination's sake; rather, organisations coordinate to pursue an *end* or purpose. Consequences reflect the extent to which organisations attain what they set out to attain at the start of the coordination process (Pfeffer & Salancik, 1978; Provan & Sydow, 2008). To understand the consequences of the coordination of inter-organisational relationships is of critical theoretical importance as organisations increasingly depend on coordination across organisational boundaries. The enthusiasm about inter-organisational relationships is spreading among scholars and practitioners. However, we seem to know little about the consequences of coordination among organisations. Looking at alliance success, Kale and Singh (2009) find that alliances have a very low success rate, with up to 70% of them failing.

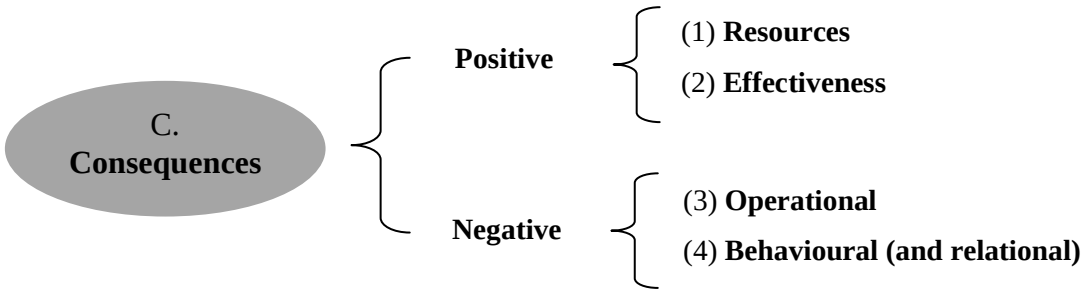
Surprisingly, scholars have focused on explaining the 'positive' consequences (Baum et al., 2003; Gulati & Nickerson, 2008; Nickerson & Silverman, 2003). The lack of interest in the negative consequences of relationships is expressed by Katila et al. (2008, p. 296): 'scholars studying relationships between new and established firms strongly emphasize the positive outcomes … but neglect the negative ones'. The call for studies on negative outcomes has been expressed in numerous literature reviews on inter-organisational relationships (Borgatti et al., 2011; Kilduff et al., 2010; Nohria, 1992; Oliver et al., 1998; Provan & Sydow, 2008).

The dysfunctionalities in internal organisational relationships have received little attention, despite spectacular coordination problems being 'showcased' in the media on a regular basis (Heath & Staudenmayer, 2000). According to Podolny and Page (1998, p. 71), 'this enthusiasm for network forms of organization seems difficult to reconcile with an important fact: An extremely large fraction of network forms of organization do not perform the function for which they were designed'.

I argue, therefore, that a balanced view is required of the consequences of the coordination of inter-organisational relationships: there is an over-emphasis on the

positive outcomes at present (**Figure 5**). Thus, I shall review the positive, but also the negative, consequences of inter-organisational relationships, in a quest for completeness. At first glance, the positive-negative dichotomy is exposed to subjectivity issues. A consequence might be regarded as negative by one organisation and positive by another. From an epistemological standpoint, such a dichotomy also involves judgment, which varies among parties. Following prior research (Katila et al., 2008; Podolny & Page, 1998), I use *positive* here to refer to generalised positive consequences (intended) and *negative* to mean generalised negative consequences (unintended)[34].

Figure 5 Summary of Consequences



2.3.1. Positive Consequences

Most prior research identifies 'access to resources' and 'effectiveness' as positive consequences that stem from coordination of inter-organisational relationships. Positive consequences relate directly to the extent to which organisations achieve the goals that drove the formation of the ties (i.e. accessing resources)

(1) **Resources** underlie the strategic motivations that lead organisations to initiate coordination (**Table 4**). Through coordination, organisations access resources, such as technology, R&D capabilities, financial resources and new markets.

Accessing the resources available within other organisations is important as organisations are increasingly interdependent on counterparties for production (Pfeffer & Salancik, 1978; Wernerfelt, 1984). For instance, firms in Italy's districts form ties to access specialised technology and facilities that are available locally

[34] Of course, positive consequences might be unintended in the first place and *vice versa*. A discussion of the idiosyncrasies of these labels falls outside the scope of this thesis. I use the notions of *positive* and *negative* as generalised categories (as used in prior research). However, I shall detail these epistemological aspects further as required in this thesis.

(Lazerson, 1988). Access to technology and R&D capabilities is another positive consequence, as is shown by technology alliances. In the biotechnology industry, research consistently reports that inter-organisational relationships provide organisations with critical R&D capabilities (Baum et al., 2000; Owen-Smith & Powell, 2004; Prevezer, 2001). For instance, Baum et al. (2000) find that establishing inter-organisational ties brings positive consequences for organisations in terms of the ratio between revenue and R&D spending. The importance of inter-organisational ties in terms of providing access to R&D increases in highly dynamic markets such as biotechnology (Powell et al., 1996).

Prior research consistently highlights access to new markets as a generalised positive consequence for organisations (Baum et al., 2000; Doz, 1996; Eisenhardt & Schoonhoven, 1996; Gulati, Lavie, & Madhavan, 2011a; Stuart, 2000). An organisation's access to new markets occurs through ties between established and new firms. Doz (1996) reports that small pharmaceutical firms gain access to new markets through alliances with large firms. Baum et al. (2000) suggest that Canada's biotechnology start-ups that have ties with established firms acquire more financial endowments than other start-ups. In a study of agencies working with United Way[35], Provan, Beyer and Kruytbosch (1980) find that agencies that coordinate with important community elements receive more financial support for their activities.

(2) **Effectiveness** captures a performance-grounded perspective that has a long tradition in the literature (**Table 4)**. Before I attempt to come up with a definition, I will first note that performance and effectiveness are often used interchangeably. I have observed, however, that performance refers mostly to consequences for individual organisations (e.g. profits), while effectiveness tends to be used in studies taking an extended view of the consequences of a general output from a group of organisations. In line with my motivation to investigate the coordination of inter-organisational relationships, I adopt the view of effectiveness. Following prior research (Davis & Eisenhardt, 2011; Provan & Milward, 1995; Sydow & Windeler, 1998), I take effectiveness in inter-organisational relationships to be the extent to which organisations attain a common goal. Furthermore, I distinguish between direct and indirect measures of effectiveness.

[35] United Way is an US-based organisation that works with the local communities on welfare issues relating to education and health (further information is available at http://liveunited.org/).

Direct measures of effectiveness have received wide attention in research based on sales growth (Stuart, 2000) and venture survival (Sapienza et al., 2006). In innovation-motivated collaborations, the number of patented products is widely used to gauge effectiveness. Ahuja (2000a) reports that (direct) inter-organisational ties lead to a larger number of patents among firms in the international chemicals industry. The mechanism reported is ties that give organisations access to knowledge, which in turn leads to a superior capacity to innovate. George et al. (2002) also find that inter-organisational coordination between privately-held organisations and universities has positive consequences for organisations. For instance, privately-held organisations with links to universities have substantially superior financial performance – measured as 'net sales to total assets' – to firms without these linkages (George et al., 2002, p. 599). Lee (2010) reports that, over the period 1976–1995, US biotechnology inventors with track records of collaboration took bridging positions in configurations of inter-organisational relationships (providing the organisations in question with a larger number of patents). In both studies, coordinating inter-organisational ties led to effectiveness.

Indirect measures attempt to capture consequences that span organisational boundaries. For instance, a direct measure such as sales growth relates to an individual organisation; however, an indirect measure such as innovation output is often shared by all parties involved in the project. Here, the reasoning is as follows: 'the performance of each firm comes to depend not only on its own capabilities and strategies but also on those of its allies and on its relationships to these allies' (Gomes-Casseres, 1996, p. 3). This observation has led scholars to include indirect measures of effectiveness, such as the number of new products, perceived measures of effectiveness and new opportunities gained by the partners. The work of George et al. (2002) on links between privately-held organisations and universities provides a good example of the integration of direct and indirect measures.

Inter-organisational ties lead to more innovations, but also to generalised perceptions of success and effectiveness. Recent research uses perception-oriented indicators. Ozcan and Eisenhardt (2009) use a set of several effectiveness indicators in their study of alliance portfolios in the wireless gaming industry. The indicators include the number of hit games, the total number of games, the number of handsets per game and a subjective assessment of effectiveness. In another study, Davis and Eisenhardt (2011) report the outcomes of inter-organisational ties according to the

following dimensions: new technologies generated, market acceptance and product performance, and the perceived evaluation of success among participants. The authors find that the mechanism that leads to higher effectiveness is that of rotating the leadership among the organisations involved in the project. Measures of perceived effectiveness are also used among organisations that provide services to the community, in the form of customer satisfaction. Provan and Milward (1995) argue that network integration among health care providers promotes higher perceived effectiveness as reported by the clients, in terms of quality of life, client satisfaction, psychopathology, and level of functioning.

However, effectiveness is not always a direct consequence of inter-organisational relationships. Rather, several non-discrete actions and phenomena occur within inter-organisational relationships, such as the governance structures and prior experience of organisations. A study of 145 biotechnology alliances suggests that, once governance mechanisms and experience in the industry have been accounted for, the routines of inter-organisational coordination enhance the effectiveness of collaborative agreements (Zollo, Reuer, & Singh, 2002). Accumulated knowledge enhances organisations' operations through a long-term effect. Inter-organisational ties help to transfer new knowledge but they also allow for the reintegration of knowledge (Eisenhardt & Martin, 2000; Kogut & Zander, 1992; Powell et al., 1996; Teece, Pisano, & Shuen, 1997). In their study of the Mère et Enfant in the Gaza Strip, Hardy et al. (2003) emphasise the role of knowledge creation through inter-organisational ties (**Table 4**). Knowledge enhances organisations' effectiveness, for example through the learning of new skills and capabilities.

Learning is a key outcome of inter-organisational relationships (Ariño & Torre, 1998; Cohen & Levinthal, 1990; Doz, 1996; Kogut & Zander, 1996; Zollo & Winter, 2002). Organisations that are able to engage in a constant learning process over time and to integrate new information show a higher likelihood of alliance success (Doz, 1996). Repeated learning cycles are related to higher task effectiveness (Cohen & Levinthal, 1990). Organisations learn operations-related skills and capabilities that contribute towards positive outcomes; this has been argued extensively in the literature. Recent research suggests that organisations also learn about the use of administrative mechanisms of inter-organisational coordination. Lumineau, Fréchet and Puthod (2011) find that the contracting process engenders rich learning for the organisations themselves and their partners.

Table 4 Outcomes of Inter-Organisational Relationships Coordination

Outcomes	Relationship with coordination	Theoretical reasoning on outcomes	Research evidence on outcomes	Examples
Positive Consequences				
1. Resources - Technology and facilities - R&D capabilities - New markets - Financial resources	**Nodes** ($_i$ and $_j$) •	Coordination of inter-organisational relationships leads to positive consequences for organisations, i.e. technology and facilities, R&D capabilities, new markets and financial resources.	(Baum et al., 2000; Doz, 1996; Eisenhardt & Schoonhoven, 1996; Gulati et al., 2011a; Hallen, 2008; Lazerson, 1988; Pfeffer & Salancik, 1978; Powell et al., 1996; Provan et al., 1980; Sorenson & Stuart, 2001; Stuart, 2000; Wernerfelt, 1984)	* Firms in Italy's districts coordinate their ties to access specialised technology and facilities available locally; * Canada's biotechnology start-ups that have ties with established firms acquire more financial resources.
2. Effectiveness - Sales growth - Venture survival - Patented products - Financial performance - Perceived measures of effectiveness - Knowledge - Learning	**Configuration** ($\sum\{x_{ij}\}$) 	Coordination of inter-organisational relationships generates higher effectiveness, either directly (e.g. sales growth, patented products and financial performance) or indirectly (e.g. knowledge and learning).	(Ahuja, 2000a; Ariño & Torre, 1998; Baum & Oliver, 1991; Cohen & Levinthal, 1990; Davis & Eisenhardt, 2011; Doz, 1996; Eisenhardt & Martin, 2000; George et al., 2002; Gomes-Casseres, 1996; Gulati, 1995a; Gulati et al., 2011a; Hardy et al., 2003; Human & Provan, 2000; Kogut & Zander, 1992; Kogut & Zander, 1996; Lee, 2010; Lumineau et al., 2011; Ozcan & Eisenhardt, 2009; Powell et al., 1996; Provan & Milward, 1995; Sapienza et al., 2006; Stuart, 2000; Teece et al., 1997; Zollo et al., 2002; Zollo & Winter, 2002)	* Privately held organisations with more university links have substantially superior financial performance than firms without these links; * Routines lead to higher effectiveness among biotechnology firms; * Mère et Enfant, providing international aid in the Gaza Strip, relied on involved and embedded inter-organisational ties for knowledge creation.

(Table continues in next page)

Negative Consequences				
3. Operational - Miscommunication - Responsiveness - Delays - Additional costs of operations	**Ties** (x_{ij}) ●-●	Through the effort to coordinate inter-organisational relationships, negative consequences emerge for organisations such as miscommunication, lack of responsiveness, delays and additional costs of operations	(Ariño & Torre, 1998; Brown & Eisenhardt, 1998; Davis & Eisenhardt, 2011; Eccles, 1981; Eisenhardt, Furr, & Bingham, 2010; Grandori, 1997a; Granovetter, 1985; Heath & Staudenmayer, 2000; Kogut & Zander, 1996; Mitev, 1996; Simon, 1976; Srikanth & Puranam, 2010; van de Ven, 1976; Williamson, 1991)	* Miscommunication among building companies results in misleading decisions about on-site work arrangements; * American car makers struggle to communicate across areas of expertise compared to their Japanese competitors.
4. Behavioural (and relational) - Misalignment - Misappropriation - 'Double-sword' mechanisms - (Over)embeddedness	**Ties** (x_{ij}) ●-● **Configuration** ($\sum\{x_{ij}\}$) 	Organisations might engage in misalignment and misappropriation behaviours since *administrative mechanisms* might also harm coordination. A high degree of embeddedness nonetheless promotes negative consequences regarding coordination.	(Casciaro & Piskorski, 2005; Coase, 1937; Eccles, 1981; Gargiulo & Benassi, 2000; Gomes-Casseres, 1996; Graebner, 2009; Granovetter, 1973; Greve et al., 2010; Pfeffer & Salancik, 1978; Simmel, 1956; Uzzi, 1997; van de Ven & Gordon, 1984; Williamson, 1996; Zaheer & Zaheer, 1997)	* In acquisitions of entrepreneurial firms, some might develop erroneous trust perceptions; * A high degree of embeddedness among alliance members drives joint withdrawals (alongside task-related causes).

2.3.2. Negative Consequences

Negative consequences of inter-organisational relationships are implicit in most of the theorising on inter-organisational relationships. For instance, concerns about opportunistic behaviour and the misalignment of organisations are at the epicentre of transaction cost theory (as I noted in **Chapter I**). Consider everyday life examples of miscommunication (Heath & Staudenmayer, 2000) or a lack of trust among parties (Graebner, 2009). As an extreme case, one might consider an unsuccessful alliance (Kale & Singh, 2009) or the failure of a project (Ariño & Torre, 1998; Mitev, 1996). In one way or another, these are problems in which one party is unable to anticipate the other's actions and adjust its own accordingly (Schelling, 1960).

However, previous research seems not to have conceptualised the notion of negative consequences. Some authors refer to 'failures of coordination' (Williamson, 1991), 'coordination neglect' (Heath & Staudenmayer, 2000) or just mention 'coordination problems' (Grandori, 1997a; Srikanth & Puranam, 2010). One obstacle is the lack of prior conceptualisations of negative consequences of coordination of inter-organisational relationships – despite allusions in the literature (Katila et al., 2008). Following the work of Polodny and Page (1998, p. 71), I argue that negative consequences can be understood as 'dysfunctionalities that arise through the operation of the network' of organisations. Accordingly, I single out two types of coordination problems: operational and behavioural/relational (**Table 4**).

(3) **Operational** coordination problems refer to mundane coordination problems that may compromise purpose and represent a diversion from the anticipated course of action. This includes daily episodes of miscommunication and organisations' slow responsiveness. The manifestation of operational coordination problems might encompass delays and additional costs for operations. To this extent, operational coordination problems call to mind the notion of effectiveness.

Miscommunication is one of the principal impediments to effective collaboration and is particularly severe when the judgments to be made are subjective (Granovetter, 1985). In a study of the Massachusetts-based building industry, Eccles (1981) reports that organisations are constantly producing subjective assessments, with direct effects on coordination-related actions. For instance, quantity-surveying firms regularly update organisations on the cost of the building works. These updates require organisations to implement practical solutions (e.g. to work extra hours) to tackle concerns over delays

and budget. This example illustrates the role of information flows among organisations but also the importance of information accuracy for the coordination process. Poor-quality information has repercussions for coordination.

The sources of operational-type coordination problems relate primarily to the 'definiteness' of the tasks (Simon, 1976). An organisation's individual scope of responsibility may become blurred when work is spread across several organisations. A broader scope of responsibility provides organisations with flexibility, which is necessary if they are to address changing task demands (e.g. task-related uncertainty) and demands from other organisations (e.g. demands for synchronisation with other organisations) (Davis & Eisenhardt, 2011; Eisenhardt et al., 2010). Miscommunication often stems from a lack of cross-understanding among organisations, particularly if they have different industrial backgrounds (Kogut & Zander, 1996).

Modes of specialisation among organisations affect inter-organisational communication whenever the latter challenges the assumptions of common understanding (Simon, 1976). These assumptions are embodied in the language, practices and conventions that are often specific to, for instance, an industry or a profession (**Table 4**). Heath and Staudenmayer (2000) propose the thesis that individuals develop lay theories of coordination – common-sense ways of organising and coordinating with others. These theories create a substantial obstacle to effective coordination across organisational boundaries. The authors rely on a large – and anecdotal – repertoire of coordination problems experienced by organisations. In a comparison between Japanese and American car manufacturers, they find that communication efficiency across different areas of expertise (e.g. design and production) gives the Japanese car maker, Toyota, sustained and superior efficiency over their American competitors, GM. Similar insights are reported across several industries (Brown & Eisenhardt, 1998). Efficient and accurate information flows prevent organisations from experiencing 'blind spots', that is, episodes where coordination of inter-organisational relationships is needed but the organisations cannot anticipate or assess this need.

Heath and Staudenmayer (2000) coin the notion of 'coordination neglect'. The message is that, however engaged organisations and individuals are in solving a problem, even when it is related to their competence, the parties fail to coordinate. First, there is a focus on the process rather than the integration of the parties. This is worsened by an increasing 'division of labour'. Organisations constantly outsource their activities

in search of efficiency but, even above a reasonable threshold, organisations continue to divide tasks rather than coordinate to achieve integration. Second, organisations fail to communicate effectively with specialist suppliers.

Operational coordination problems accrue negative consequences for organisations, such as delays and additional costs of operations. Constant episodes of miscommunication are associated with delays (Srikanth & Puranam, 2010). Although delays are costly for organisations, however, the use of tighter administrative mechanisms of coordination also entails additional costs. Organisations may agree to hold meetings (i.e. managerial apparatuses) to prevent coordination problems. However, these are costly. In a study on early childcare agencies, van de Ven (1976, p. 33) found that 'personal contact and committee meetings absorb much time and effort and are inefficient mechanisms of coordination activities that can be standardised'.

In summary, the operational types of negative consequences are miscommunication, delays and additional costs for organisations. Although prior research has not conceptualised these consequences in a systematic way, some researchers suggest that individuals develop lay theories of coordination that (1) focus more on the process than the integration of the parties, and (2) prevent effective communication with specialist suppliers. This leads me to explore the behavioural aspects that underlie the negative consequences of coordination of inter-organisational relationships.

(4) **Behavioural (and relational)** coordination problems entail misalignment and misappropriation. These are key concerns in the prior research on transaction costs (Coase, 1937; Williamson, 1996). Organisations may misappropriate resources. For instance, in technology alliances innovations often require the sharing of trade secrets and novel information (Gomes-Casseres, 1996) (**Table 4**).

Although the origins of a lack of trust are diverse, trust often constrains organisations' behaviour and relations with other parties. In a study of acquisitions of entrepreneurial firms, Graebner (2009) finds that trust persists and shapes how firms interact through the acquisition process. Although trust perceptions concerning counterparties may be erroneous, they shape entrepreneurs' intentions to compromise and reach a consensus. Reaching consensus is often driven by power relations originating in the logic of task interdependence (Pfeffer & Salancik, 1978).

Sanctions aim to incentivise organisations to follow a given course of action. However, and according to Williamson (1991, p. 278), 'failures of coordination may arise because autonomous parties read and react to signals differently, even though their

purpose is to achieve a timely and compatible combined response'. Alongside organisations reacting differently to signals, incentive systems may also suffer from contradictions that lead to a misalignment of organisations This is described as 'incentives conflict' at the contract and inter-organisational levels (Coase, 1937). For example, the main contractors are often incentivised to bid low in the marketplace (to meet the client's desire for a low price); however, building firms themselves seek to maximise profit (Eccles, 1981). Thus the client's desire to spend the minimum may conflict with the quality standards that the main contractor wishes to deliver. These organisations face a trade-off between competitiveness and profits.

This tension is typically addressed through coordination mechanisms (e.g. administrative mechanisms). However, 'increasing formalization and monitoring in an IR [inter-organisational relationship] leads to conflict and dissensus among participants' (van de Ven & Gordon, 1984, p. 605). The 'division of labour' among organisations itself creates differences in interests and in perceptions about those interests, and these are both sources of conflict (Simmel, 1956). Similarly to Coase with his concept of incentives conflict (1937), Simmel (1956) offers the notion of 'antagonistic cooperation' to capture situations where organisations establish coordination despite antagonistic interests. This is the case with technology alliances that involve exchanging trade secrets (Gomes-Casseres, 1996).

A final source of negative consequences of the coordination of inter-organisational relationships is a high level of embeddedness. My argument about embeddedness so far has been that it enhances coordination. However, a high degree of embeddedness also hinders the process of coordination by introducing rigidities into the ability of organisations to pursue instrumental goals (Granovetter, 1973; Uzzi, 1997). Alertness and responsiveness affect an organisation's effectiveness (e.g. profitability). Interdependence may also necessitate coordination with distant organisations, for example by mobilising new suppliers (Uzzi, 1997) or inducing task-driven change into densely connected configurations (Gargiulo & Benassi, 2000).

Following the same line of argumentation, recent research suggests that embeddedness also creates friction in inter-organisational relationships. For instance, joint withdrawals from alliances may be explained by task-related causes but can also, it is argued, be a consequence of the closeness in inter-organisational relationships, such as the presence of triads, which is typical of dense configurations (Greve et al., 2010).

In summary, negative consequences such as miscommunications, misappropriation of resources (and rents) and unintended outcomes that result from mechanisms aimed at coordination (e.g. contractual arrangements) are widely mentioned in the literature. Yet, they have not benefited from systematic research to date.

2.4. Assessment of the Literature and 'Burning Issues'

The first insight that emerges from this literature review is the extensiveness of prior research on coordination and inter-organisational relationships. I have built on this extensiveness to develop a theoretical framework of the process of coordination of inter-organisational relationships. The result is a deep theoretical understanding of several theoretical mechanisms that, although previously studied without a coordination-based focus, provide several 'clues' about the coordination of inter-organisational relationships.

Although extensive, I argue that the literature on inter-organisational relationships contains various 'burning issues' from a theoretical perspective. First, and perhaps foremost, 'scholars have paid less attention to the critical role of coordination' (Gulati et al., 2012b). Specifically, the phenomena of coordination have not benefited from systematic research, unlike other areas such as the role of contracts, goodwill, trust and the structure of ties among organisations. Drawing on recent reviews (Gulati et al., 2011a; Kilduff & Brass, 2010; Provan et al., 2007) and my own research interests, I have identified three burning issues in the pursuit of a theoretical insight into the coordination of inter-organisational relationships: the heterogeneity of organisations, the mixture of contractual arrangements and the dynamics of inter-organisational relationships.

(1) **Heterogeneity of organisations** captures the diversity of organisational expertise among different organisations (Lee, 2010; McEvily & Zaheer, 1999). It relates to fluctuations in the demand for organisation-specific ($_i$) inputs depending on the stage of the project and the tasks that need to be accomplished (i.e. the purpose). In an example based on the Boeing 787 Dreamliner alliance programme, Gulati et al. (2011b) show that within-alliance demands for inputs may change over time, posing substantial challenges for inter-organisational relationship coordination. In that case, successive delays and miscommunications among various suppliers regarding, for instance, the

fitting of components, negatively affected the programme (Gulati et al., 2011b). Contrary to Cyert and March's claim (1963) that the external environment of the firm consists, in part, of other firms with comparable (i.e. similar) characteristics, inter-organisational relationships are becoming increasingly heterogeneous. Heterogeneity refers to the spectrum of organisations, based on their characteristics (e.g. industry and size). The alliance programme for the Boeing 787 Dreamliner project is highly heterogeneous, combining organisations drawn from a variety of industries, such as manufacturing (e.g. engine manufacturers/ Rolls Royce), plastics (e.g. fittings suppliers) and electronics (e.g. control panel suppliers).

Alongside task-related demand shifts, increasing specialisation – that is, the 'division of labour' (Durkheim, 1984; [1893] – also requires the coordination of a greater heterogeneity of organisations. Any purpose relies on the integration of components and skills that exist across different organisations (Pfeffer & Salancik, 1978). Each organisation brings along a 'socio-economic luggage' of practices and strategic motivations (Bechky, 2006; Hardy et al., 2005). These aspects are idiosyncratic to 'organisational fields', in other words, groups of suppliers and regulators (DiMaggio & Powell, 1983) (**Table 5**).

Coordination among organisations thus engages with heterogeneous organisations. However, the impact of heterogeneity for coordination is currently insufficiently studied. Scholars widely acknowledge that heterogeneity affects inter-organisational relationships but shortcomings remain due to mixed findings. In the late 1970s, van de Ven (1976, p. 32) noted that 'the evidence is conflicting on whether domain similarity helps or hinders the establishment of an IR [inter-organisational relation]'. Thirty-five years later, the puzzle of the effect of heterogeneity still motivates research (Goerzen & Beamish, 2005; Harrison & Klein, 2007; Reagans & Zuckerman, 2001).

On the one hand, heterogeneity of organisations widens the 'pool of resources', including information (Burt, 1992), knowledge (George, Kotha, & Zhang, 2008) and technology (Srivastava & Gnyawali, 2011). McEvily and Zaheer (1999) find that manufacturers that establish ties with regional institutions in the US Midwest are well-positioned to access new information, ideas and opportunities. On the other hand, heterogeneous inter-organisational networks are costly to coordinate (Ring & van de Ven, 1992) and maintain (Gulati & Singh, 1998). If the argument on 'homophily' suggests that similarity promotes coordination and common heuristics (Kogut & Zander, 1996), it also implies that differences among organisations hinder coordination

due to a few common heuristics. Moreover, heterogeneity of organisations also affects the potential for the alignment of organisations' interests. Thus, there is a requirement for contractual safeguards with incentive systems and sanctions to ensure inter-organisational relationship coordination.

In summary, inter-organisational relationships engage numerous organisations with different organisational expertise; this is driven by the demand for specific expertise that is increasingly spread outside organisational boundaries. Nonetheless, the heterogeneity of organisations remains under-studied in relation to mechanisms of coordination.

(2) **A mixture of contractual arrangements** is increasingly becoming part of most inter-organisational ties (x_{ij}). This is a 'burning issue' for research because the latter has so far neglected the implications – if any – of the co-existence of various forms of contracting in configurations of inter-organisational relationships. Bradach and Eccles (1989, p. 98) warn about a 'plurality of independent forms of coordinative exchange rather than the continued mutually exclusive existence of models on combination'. By models, they are referring to contractual arrangements among organisations[36]. Recently, Gulati, Puranam and Tushman (2012a, p. 572) have argued that 'prominent forms of economic organization increasingly involve multiple firms as well as communities of noncontractually linked individuals'. This calls for an understanding of inter-organisational relationships as a 'patchwork' of contractual arrangements, from which idea several insights emerge (**Table 5**).

First, the mixture of contractual arrangements is linked to the aforementioned challenge of the heterogeneity of organisations (across the whole configuration of inter-organisational relationships). The relevance of a 'wider pool of resources' raises concerns over alignment among organisations that are highly interdependent. As a result, Barney and Hansen (1994, p. 183) posit that 'heterogeneity in governance skills and abilities is an important explanation of variance in a wide range of different economic exchanges'. Further, Burt (1992, p. 33) posits: 'There is no long-term contract that keeps a relationships strong, nor legal binding that can secure the trust necessary to

[36] This is mentioned further in the article. The authors also use the notion of plurality to capture the case where a diversity of 'control mechanisms in the same organizational structure are operated simultaneously by a company to perform the same function' (Bradach & Eccles, 1989, p. 99).

a productive relationship. Your network is a pulsing swirl of mixed, conflicting demands'. This remark suggests that the usefulness of contracts changes over time.

Second, the pertinence of contracts varies according to the stage of the inter-organisational relationship. In the early stages, concerns about misappropriation and misalignment are more salient among organisations because of the lack of information available to support evaluations of future behaviour predictability (Doz, 1996; Faems, Janssens, Madhok, & Van Looy, 2008). Van de Ven et al. (1976) suggest that the importance of contractual safeguards decreases over time. Similarly, Gulati (1995) suggests that previous experience of working together substitutes – through familiarity – for tight governance structures in alliances.

Third, inter-organisational relationships combine administrative and relational mechanisms of inter-organisational relationship coordination. For instance, according to Doz (1996), organisations engaged in alliances progressively start to monitor for efficiency and adaptability as part of a learning cycle. As a result, the usefulness of contracts changes over time because of emerging *relational* mechanisms of coordination. Yet, the mixture of contractual arrangements also occurs because not all organisations in the configuration of inter-organisational relationships have prior experiences of working together. Organisational theory shows the importance of informal ties; recalling the example of the New York Museum of Modern Art, informal relationships mattered and co-existed with contractual ties with other parties such as sponsors (DiMaggio, 1992). Thus, entrepreneurs use their informal ties to leverage inter-organisational network activity. Examples of factors that appear recurrently in the literature as governing the informality of ties include ethnic similarity (Vissa, 2011) and expertise (Fuchs & Garicano, 2011) (**Table 5**).

Finally, non-contractual ties complement administrative mechanisms of inter-organisational relationship coordination (Macaulay, 1963; Ring & van de Ven, 1994). Research has found that a mixture of contractual arrangements promotes higher effectiveness for organisations (Mariotti & Delbridge, 2012; Uzzi, 1997). For instance, it can prevent organisations from evolving towards centralisation and rigidity (Eisenhardt et al., 2010; Siggelkow & Levinthal, 2003).

The mixture of contractual arrangements forms a 'burning issue' as organisations operate across several contractual arrangements and participate in the multiples projects governed by diverse incentive systems and mechanisms of coordination.

Table 5 Emerging Insights on the Coordination of Dynamic Inter-Organisational Relationships

Enduring challenges	Relation with coordination	Emerging theoretical insights	Research evidence	Examples
1. Heterogeneity of organisations - Fluctuations of task-related demands - Task specialisation - New resources versus costly coordination mechanisms	**Nodes** ($_i$ and $_j$) ●	Fluctuations of task-related demands and increasing specialisation increase the heterogeneity of organisations, which allows them to access information and technology but also reduces cross-understanding. This must be compensated for using costly administrative coordination mechanisms.	(Burt, 1992; Cyert & March, 1963; DiMaggio & Powell, 1983; Durkheim, 1984; George et al., 2008; Gulati & Singh, 1998; Gulati et al., 2011b; Kogut & Zander, 1996; McEvily & Zaheer, 1999; Pfeffer & Salancik, 1978; Ring & van de Ven, 1992; Srivastava & Gnyawali, 2011; van de Ven, 1976)	* The Boeing 787 Dreamliner alliance programme required many specialised organisations but coordination problems among the parties led to delays; * US Midwest manufacturers who establish ties with regional institutions are found to be well-positioned to access new information, ideas and opportunities.
2. Mixture of contractual arrangements - Contractual needs change over time - Co-existence of contractual and non-contractual arrangements	**Ties** (x_{ij}) ●-●	The need to use contractual arrangements changes over time with the outcomes of fluctuations of task-related demands (and consequently turnover of organisations) and the accumulation of experience of working together. Organisations also benefit from combining contractual and non-contractual arrangements.	(Barney & Hansen, 1994; Bradach & Eccles, 1989; Burt, 1992; DiMaggio, 1992; Doz, 1996; Eisenhardt et al., 2010; Fuchs & Garicano, 2011; Gulati, 1995a; Macaulay, 1963; Mariotti & Delbridge, 2012; Ozcan & Eisenhardt, 2009; Ring & van de Ven, 1994; Santos & Eisenhardt, 2009; Siggelkow & Levinthal, 2003; Uzzi, 1997; van De Ven et al., 1976; Vissa, 2011)	* Alliances progressively start to monitor efficiency and adaptability as part of the learning cycle; * Entrepreneurs combine contractual ties and, more importantly, non-contractual ties to achieve efficiency.
3. Dynamic inter-organisational relationships - Methodology - (Poor) Predictability of evolution of ties	**Configuration** ($\sum\{x_{ij}\}$) 	Inter-organisational relationships are evidently dynamic. However, current methodology and theorising are still dominated by static approaches.	(Borgatti & Halgin, 2011; Coase, 1937; Davis & Eisenhardt, 2011; Galaskiewicz, 1985; Granovetter, 1992; Gulati & Gargiulo, 1999; Kilduff & Brass, 2010; Maurer & Ebers, 2006; Oliver, 1990; Podolny & Page, 1998; Uzzi, 1997; van de Ven & Gordon, 1984; Williamson, 1981)	* Most recent literature on social network studies reviews the scarcity of longitudinal approaches; * Technology collaborations reach a high level of effectiveness through rotating the leadership among organisations.

(3) **The dynamics of inter-organisational relationships** are an irrefutable aspect of configurations of inter-organisational relationships ($\sum\{x_{ij}\}$) and must be taken into account. Despite the numerous calls for research on the topic, current research is scarce (**Table 5**). This is shown in recent literature reviews (Ahuja et al., 2012; Borgatti & Halgin, 2011; Kilduff & Brass, 2010; Provan et al., 2007; Zaheer, Gözübüyük, & Milanov, 2010). The main finding is that inter-organisational relationships constantly change over time; however, there is little understanding of the underlying mechanisms of how inter-organisational relationships change. Constant changes occur at two levels: structural (who has ties with whom) and relational (who trusts whom).

It is commonly agreed that 'an understanding of this process [social construction of economic institutions] requires that both theory and empirical research pay attention to the dynamics' (Granovetter, 1992). I use this quotation because it draws a distinction between method and theory (something I have been arguing for in this thesis). This distinction offers the first challenge, one that is methodology-based. Recent literature reviews attest to the difficulties that scholars face in collecting longitudinal data (Borgatti & Halgin, 2011; Kilduff & Brass, 2010).

The second challenge – and perhaps a more pressing one – relates to theory. The most significant shortcomings are in theorising the dynamics of inter-organisational relationships. Dyads – pairs of organisations – have been the focus of most relevant theorising on the coordination of inter-organisational relationships, as I have demonstrated in my review in this chapter. Research informed by transaction costs focuses exclusively on the transactions between two organisations (Coase, 1937; Williamson, 1981). Some of the thinking has been imported into the social network approach to examine configurations formed by an assortment of dyads (Galaskiewicz, 1985; Podolny & Page, 1998). However, inter-organisational networks are formed of embedded inter-organisational ties that connect organisations that were previously distant and disconnected (Uzzi, 1997). Researchers call, therefore, for research that examines the whole network (Provan et al., 2007).

Inter-organisational relationships are formed with a purpose, and coordination is the mechanism used to achieve that purpose (Gulati & Gargiulo, 1999; Maurer & Ebers, 2006). Thus, 'if one is to understand the dynamics of IRs [inter-organisational relationships] over time, it is necessary to begin with ad hoc coordination efforts between organizations and to track how they are created, grow, and dissolve over

time' (van de Ven & Gordon, 1984, p. 598). A fruitful strand of research is the one concerned with the dynamic processes of inter-organisational relationships. Yet, research often focuses on antecedents, mechanisms and consequences as separate stages, with scant possibility of recursive processes. This assessment is reflected in the theoretical framework of this chapter but also in recent literature reviews on inter-organisational relationships (Borgatti & Halgin, 2011; Kilduff & Brass, 2010). Recent empirically informed research has started to explore the underlying mechanisms within inter-organisational relationships by looking at micro-foundations. For instance, Davis and Eisenhardt (2011) find that effective technology collaborations among mobile technology firms achieve effectiveness (e.g. new product releases) through rotating leadership.

Overall, I argue that, despite the extensiveness of research related to the coordination of inter-organisational relationships, there are 'burning issues' outstanding. A sensible assessment is that current research provides insights into many aspects of coordination but an integrating perspective is yet to emerge.

2.5. Research Opportunity

In my view, the struggle with the current theorising is to provide compelling explanations of the process of coordination of inter-organisational relationships. This presents a research opportunity; one that requires the integration of an eclectic body of literature and an in-depth study of that process over time. Current research puts an unbalanced focus on the positive consequences, and has a static view of inter-organisational relationships. I therefore aim to advance the current theorisations by examining the following two research questions:

- How are dynamic inter-organisational relationships coordinated?

- Why do coordination problems occur in dynamic inter-organisational relationships?

A simple extrapolation of answers from prior research would be a 'leap of faith'. I argue that an integrating perspective should aim to deal with issues of rationality and non-rationality, predictability and unpredictability, and both positive and negative consequences. As Simon (1976, p. xxviii; emphasis in original) urges, 'it is precisely in the realm where human behavior is *intendedly* rational, but only *limited* so, that there is room for a genuine theory of organization and administration.'

Chapter III: Methodology

Overview

In this chapter, I will argue that the UK's building industry is an appropriate empirical setting in which to unravel the theoretical underpinnings of the coordination of inter-organisational relationships. Furthermore, it presents an opportunity to engage management research with ongoing endeavours to tackle England' social housing shortage and deliver 'greener' buildings by an industry marked by low innovation.

Given the scarcity of prior research, I deployed an inductive research design aimed at building theory on the coordination of inter-organisational relationships. I started by conducting 23 semi-structured interviews with experts within the UK's building industry in order to familiarise myself with the empirical setting and plan the next stage: a multiple case-study design of seven social housing projects in the East Midlands. Completed between 2008 and 2011 at an average cost of £1.8 Million, I sampled these projects theoretically to address my research questions. I gathered unique and extensive data from over 3,900 pages from the minutes of meetings and project reports which allowed me, by drawing on the richness of the data, to develop an in-depth approach. I integrated SNA techniques to map dynamic inter-organisational relationships, and content analysis to explore coordination-related aspects that are not measurable. Although unconventional, this option was most suitable, as shown by my assessment of alternative data collection procedures.

The scope of the methodological enterprise for this study is sizeable and reported thoroughly. Overall, it proved to be an appropriate and beneficial choice for this study, as a self-assessment of validity and reliability will demonstrate in the last section of this chapter.

3. Research Methodology

The research methodology that underlies this study draws on inductive reasoning to investigate how inter-organisational relationships are coordinated and where coordination problems come from. In this chapter, I will show that the building industry provides an opportunity to investigate these questions. Further, I will report the selection criteria used to choose seven projects completed between 2008 and 2011 in the East Midlands, the data sources (entailing the minutes of monthly meetings and project reports), and the development of an in-depth approach for studying inter-organisational relationships. I conclude the chapter with a self-assessment of my research methodology.

3.1. Empirical Context: The UK's building industry

Quand les cathédrales étaient blanches, la collaboration était totale
(Corbusier, 1948, p. 46)

Tremendous amount of friction and even violence between those who built them and those who had to supply the resources and labor
(Scott, 2003, p. 95)

These two quotations[37] depict collaboration in the building industry as a contrast between a 'tremendous amount of friction' (Scott, 2003) and 'total collaboration' (Corbusier, 1948). One might be surprised to learn that both are accounts of the same event: the building of Gothic cathedrals in France. Evidently, they provide contradictory, yet frequently observed, accounts of collaboration among task-interdependent organisations engaged with the building process.

The UK building industry is often characterised by adversarial collaboration practices and limited coordination among organisations (Latham, 1994; Reichstein, Salter, & Gann, 2008). Understanding the theoretical underpinnings of the coordination of inter-organisational relationships is critical; although 'construction contributes between 5-10% of GDP, it has rarely been accorded the attention that

[37] I thank Jan Bröchner and Anna Kadefors for drawing my attention to these two accounts of the building of Gothic cathedrals, during the research workshop *Bringing the Building Back In*, Copenhagen Business School, Copenhagen, 16-18 November, 2011.

leading manufacturing and services industries, such as biotechnology or chemicals have received' (Reichstein et al., 2008, p. 601). Furthermore, the construction industry has, researchers argue, great economic and social value for the UK's economy (Pearce, 2003). The term 'construction industry' is often used interchangeably with the 'building industry'. For clarity's sake, the latter can be seen as a sub-category of the former[38]. I shall use the term 'building industry' to refer to the construction of buildings only (it excludes, for example, highways).

I argue that the building industry is an appropriate setting in which to investigate how inter-organisational relationships are coordinated and where coordination problems come from. First, building projects require coordination among heterogeneous organisations (e.g., architects, engineering firms and building contractors) whose tasks are highly interdependent (Eccles, 1981; Smyth & Pryke, 2008). In his seminal work on building firms in the state of Massachusetts, Eccles (1981, p. 337) notes that 'coordinating the work of these labor specialties [referring to carpenters, bricklayers, plumbers, pipefitters, electricians, painters, roofers, drywallers, sheet metal workers, glaziers, and laborers] over the course of a project is a complex task'. The importance of coordination among organisations with diverse organisational expertise has also been reported in the context of public infra-structure projects (e.g. roads and water supply) in the UK (Smyth & Pryke, 2008). Indeed, mechanisms of coordination are critical in this industry because 'construction projects involve inter-organizational and cross-disciplinary collaboration' (Reichstein et al., 2008, p. 604).

Second, coordination problems among organisations are routinely identified in the academic literature (Eccles, 1981; Jones et al., 1997; Korczynski, 1996; Smyth & Pryke, 2008; Soda & Usai, 1999). Trade industry reports also point out the lack of coordination among organisations (Barlow, Cohen, Jashapara, & Simpson, 1997; Latham, 1994). These are thought to stem from the so-called 'confusion of consultants' (Morton, 2002) as clients – public and private alike – are increasingly hiring consultants to assist them during the building process. Latham (1994) also suggests that lines of responsibility among organisations can be characterised as having 'fuzzy edges', which contribute to the dysfunctionalities across the network

[38] This is supported by the UK's System of Industrial Classifications (SIC), in which the activity of construction (under Section F) includes: construction of buildings (e.g. construction of residential buildings); civil engineering (e.g. construction of railways); and specialised construction activities (e.g. demolitions). A complete list of activities under Category is presented in **Appendix 1.1**.

of organisations. Latham (1994) and Morton (2002) shed light on the blurriness of lines of responsibilities among organisations, occurring primarily because of the large number of firms (e.g. main contractor and sub-contractors).

Third, inter-organisational relationships in building projects are dynamic by their very nature (Mehra, Brass, Borgatti, & Labianca, 2012; Smyth & Pryke, 2008; Soda & Usai, 1999). Due to constant fluctuations in the demand for resources, and due to task interdependence, inter-organisational ties change constantly throughout the design and build life-cycle – covering the period of time between design and project completion. The requirement for aligning interdependent organisations varies greatly according to the type of work (e.g. residential buildings and railways) and even across similar projects (Smyth & Pryke, 2008). Regardless of project-type specificities, it is reasonable to suggest that demand for task integration varies across and within stages of the design and build life-cycle. This aspect of the building industry is clearly conveyed in the *Plan of Work Stages* developed by The Royal Institute of British Architects (RIBA). This plan defines how different stages are conducted, and the considerations in terms of their organisation (**Appendix 1.2**).

Last but not least, the wide array of expertise that is required during building projects contributes to a 'melting pot' of professional identities and heuristics. This contributes to the social richness of the coordination process (Beamish & Biggart, 2010; Bechky, 2006; Hardy et al., 2005). For instance, Beamish and Biggart (2010) report that, in the (commercial) construction industry, organisations develop 'heuristics' – which can be defined as collectively constructed and maintained mental frames. These authors find that 'heuristics' sustain coordination but also discourage novel technologies and impede innovation (novel technical options). I am therefore interested in studying coordination in such a rich context.

Furthermore, and in line with my theoretical framework (**Chapter II**), there are also institutional aspects that shape the coordination of inter-organisational relationships (Eccles, 1981; Smyth & Pryke, 2008; Soda & Usai, 1999). These entail practices that relate to the functioning of the building industry. In the UK, Latham's (1994) review of procurement and contracting arrangements highlighted the importance of the practices embedded in the building industry to shed light on inter-organisational relationships. I shall examine the following relevant institutional aspects: procurement strategy, contracting strategy and performance incentives.

The procurement strategy is initiated by the client once the drawings and agreement on the project brief have been completed. Procurement strategies are sets of arrangements for ordering and managing a project, and can include tendering (i.e. the client tenders in the marketplace, seeking competitive bids from main contractors) or a non-competitive setting (i.e. the client commissions the building work directly from a main contractor) (Morton, 2002). According to the UK's *Guide on Achieving Excellence in Construction Procurement*, 'the procurement strategy identifies the best way of achieving the objectives of the project and value for money, taking account of the risks and constraints, leading to decisions about the funding mechanism and asset ownership for the project'[39].

Four standard procurement strategies are available to the client: public private partnership (e.g. PFI – Private Financing Initiative), design and build, prime contracting and frameworks. PFIs are public sector contracts designed to purchase high-quality services with defined outputs from the private sector on a long-term basis. For instance, a PFI for a primary school may include building (e.g. the entire design and build life-cycle), maintaining the infrastructure (e.g. repainting walls) and managing it (e.g. collecting the waste on a regular basis). In the design-build strategy, a main contractor is liable for the design, management and delivery of the building (e.g. new school) within a given time frame and forecasted budget. Similarly, prime contracting allocates the responsibility to manage and deliver the project in accordance with contractually agreed terms between main contractor and client. Additionally, the main contractor has to demonstrate during the initial period of operation that operating costs and performance parameters meet the cost model agreed upon. Finally, frameworks are long-term contracts for supplying products or services. The terms of the contract refer to the cost per unit (e.g. cost of road maintenance per mile or simply the price per ream of printer paper).

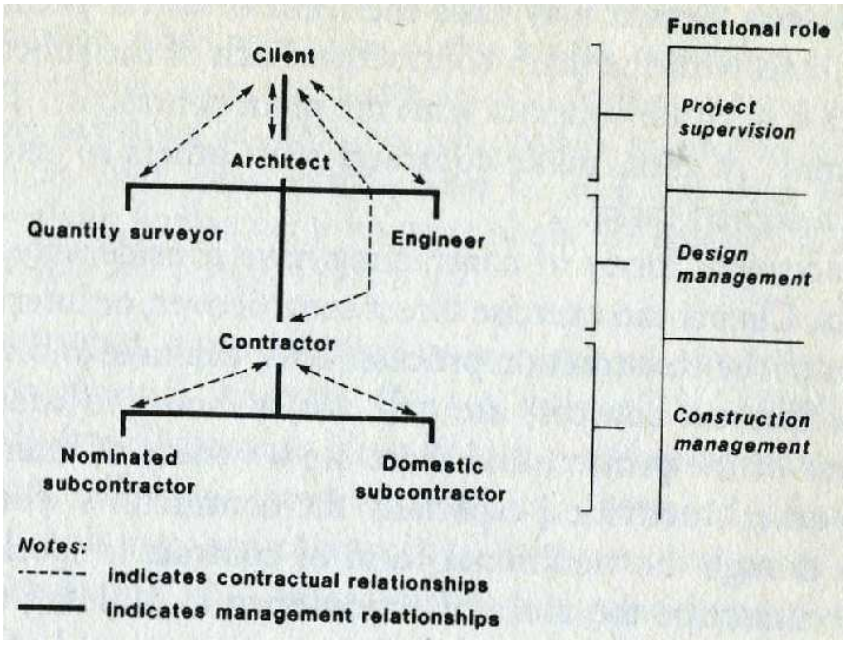
A contracting strategy entails a distinctive aspect of the building industry that shapes the architecture of the relationships among organisations. Clients and contractors have to coordinate with a wide spectrum of organisations from manufacturing (e.g. suppliers of materials and equipment) to services (e.g. engineering) (Blayse & Manley, 2004). Contractual arrangements are administrative forms of intervention used to promote the coordination of inter-organisational

[39] *Achieving Excellence in Construction Procurement Guide 06: Procurement and contract strategies*. Office of Government Commerce, London, 2003 (p. 2).

relationships (Eccles, 1981). Prior research identifies three contracting strategies: the traditional approach, project management and management contracting.

The traditional approach is characterised by separate contracts for the design and building stages (**Figure 6**). Latham (1994) asserts that a traditional approach features consultants working for a lead manager, designing and costing the scheme within the normal professional roles. Once the design has been completed, it is passed to the main contractor, who is paid a fee to build the project. Next, the main contractor mobilises a wide range of suppliers according to scheduled works and demands that are anticipated for the entire design and build life-cycle. I use 'anticipated' here because additional expertise and supplies are often required once work starts on site.

Figure 6 Traditional Approach to Contracting



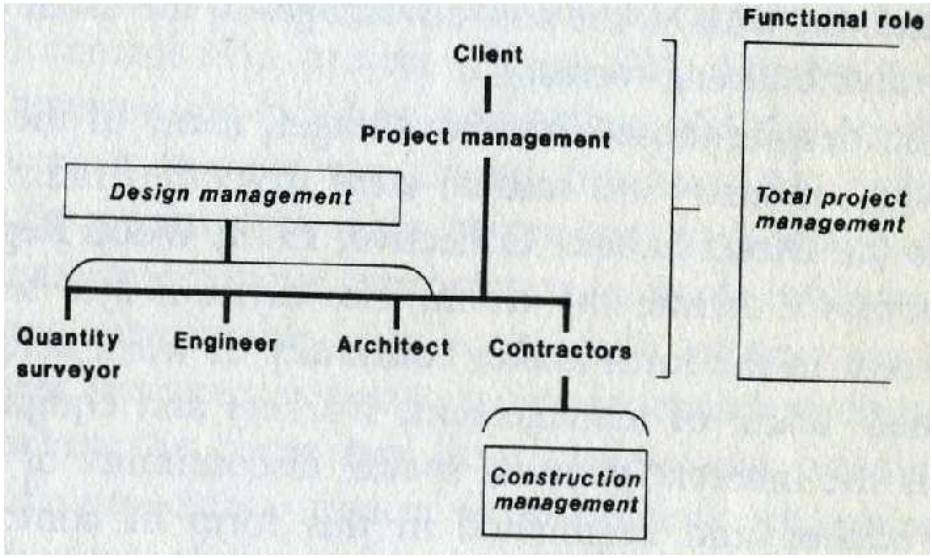
Source: Ball (1988, p. 79)

Among the advantages of the traditional approach is the control exerted by the client, who can intervene at various stages of the construction process. However, since design and building are treated as two distinct phases, the client takes a great risk because integrating the two stages might be hazardous. The organisations involved may not have previous experience of working together, which is a hurdle to coordination across both phases (Ball, 1988). Besides this, the total costs calculated at the start could be exposed to unanticipated but necessary changes – e.g. technical specifications – during the project.

Project management aims to integrate the design and construction phases (**Figure 7**). Project management is carried out by consulting firms specialised in managing the building process. Coordination between the building professionals and the on-site production process is the central function of project management teams (**Figure 7**).

A typical project management arrangement features a client's agent – frequently a quantity surveyor – working on the client's behalf throughout the design and build life-cycle. The responsibilities of the client's agent include the enforcement of deadlines for work completion, cost control and the execution of all works at the contracted standard.

Figure 7 Project Management Approach to Contracting

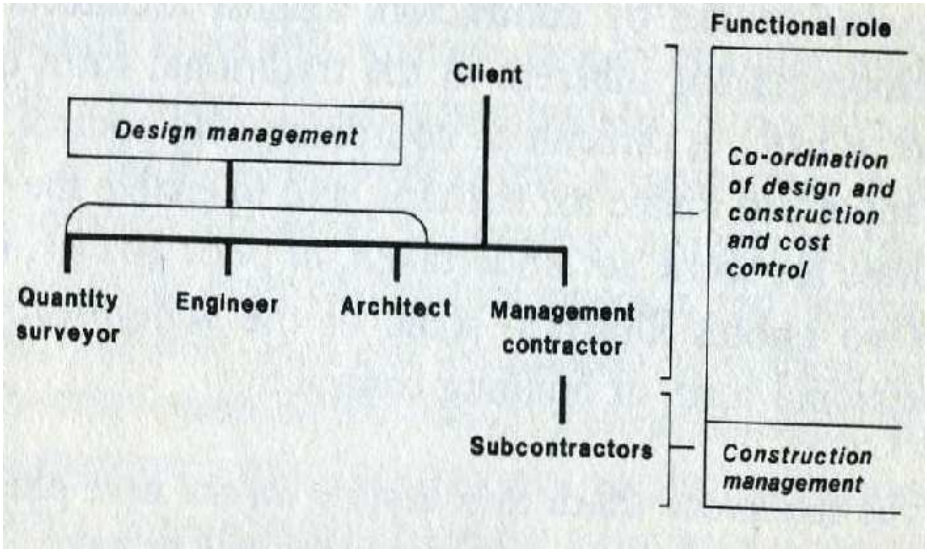


Source: Ball (1988, p. 79)

Project management is advantageous for complex projects or clients with little experience in contracting within the building industry, for example private households (Hillebrandt, 1984). Compared to the traditional approach, project management reduces the risk of misalignment across the design and build stages. Nonetheless, centralisation of the decision-making process is seen as an impediment to fast decision-making as required, such as in the case of unexpected changes to the project (e.g. unforeseen geological conditions).

Finally, in management contracting both the design and building stages are carried out by a single organisation, for example developers (**Figure 8**). A growing use of management contracting strategies has been registered following the advent of the real estate market in the UK and elsewhere (Wallis, 2001).

Figure 8 Management Contracting Approach



Source: Ball (1988, p. 79)

For instance, large main contractors have grown by concentrating on the capabilities to both design and build. That is, a single contractor can carry out the work of designing and building (and offered as a package to the client). According to some scholars (Ball, 1988; Hillebrandt, 1984), developers have evolved from main contractors who expanded their activity by acquiring in-house design capabilities. Still, some drawbacks include the reproduction of standardised buildings across cities, and the fuelling of 'uncontrolled' building, as witnessed since the 1960s in the UK and elsewhere (France, the USA and Japan).

Performance incentives are provided by clients to encourage the main contractors to fulfil their obligations as set out in procurement and contracting strategies. In other words, performance incentives are intended to align organisations towards a common goal, through generalised positive consequences. The incentives can take three forms: a *lump sum*, a fee (or percentage cost), or a target cost.

The *lump sum* requires the main contractor to place a bid for the total costs of the building work. The main contractor takes a high risk because the price offered must cover all the expenses without compromising its profit margin. The bill of quantities – a document containing the quantities of materials required and costs estimated by quantity surveyors – specifies the nature of the contract and the total amount contracted. Any variations or changes in these quantities are treated as variation orders. Extra work might be newly priced or rewarded according to the unit-calculated price stated in the bill of quantities (and submitted in the tendering process by the main contractor). The *lump sum* is widely-used in the UK's building industry.

When a fee (or percentage fee) is involved, the client agrees to pay head-office overheads and profit to the main contractor. A fee is paid to the main contractor by the client, who also pays direct costs (e.g. for materials) according to prices previously agreed upon. Consequently, the client's exposure to risk is high. Any rise in the cost of materials would increase the fee to be covered by the client. This leaves the client with little control over the total cost.

The target cost method incentivises cost awareness in contractors. Clients set a target cost for the building works on the basis of drawings and estimates made by quantity surveyors. The main contractor is rewarded according to whether it exceeds or comes in below the estimated figure. Importantly, the clients avoid the potential escalation of prices (unlike under the *fee* strategy).

However, performance incentives still do not prevent discrepancies between the client's expectations and the work delivered. Latham (1994) uses the concept of 'project-belief' to draw attention to what is seen as one of the long-lasting challenges in the UK's building industry: the ineffectiveness of performance incentives to guarantee the interests of the clients. It is common to hear, for instance, that the delivery of a new hospital is over-budget and late. These are unintended consequences of (the lack of) coordination of inter-organisational relationships, and not just mistakes in estimates. Such consequences are important from a societal perspective; over-budget projects are costly for the taxpayer. However, the argument gains further traction if one considers that enhanced coordination of inter-organisational relationships could make a difference for thousands of people on the waiting list for social housing

3.1.1. Engaged Research: England' social housing shortage and building greener

Tackling England' social housing shortage requires a combination of lower building costs and an improvement in building quality. The shortage, and current endeavours to build greener, offer an opportunity for engaged research (van de Ven, 2007). This interests me for two reasons. First, there is yet to be a response to England's social housing shortage that is informed by research on the coordination of inter-organisational relationships. Meanwhile, there are 1.84 million people in England and almost five million in the whole of the UK who are waiting for social

housing[40]. Second, social housing also acts as a benchmark for quality standards, such as environmental sustainability at low costs. This is important since building 'greener' is a challenge across the UK's building industry and calls for the engagement of management research with broader environmental issues (Ansari, Wijen, & Gray, 2011).

Regarding the shortage of social housing[41], in a recent review on the future of the sector in England, it was predicted that the number of social housing households would grow more rapidly in the 25 years following 2001 than in the previous 25 years; currently, there are over 4 million social housing tenants in England (Hills, 2007, p. 6). In an interview on BBC News[42], Labour's shadow housing minister, MP Jack Dromey, warned that 'with millions in need of a decent home at a price they can afford, the country is gripped by a growing housing crisis'. Both Hills (2007) and the MP Jack Dromey illustrate two key aspects of tackling the shortage.

First is the imperative to build 'at affordable prices'. On the social housing providers' side, building costs have increased in recent years. In parallel, the ratio of house prices to household incomes is at an historic high (Hills, 2007). The desire to increase the social housing provision has been challenged by the scarcity of financial resources (due to austerity measures that have translated into budget cuts as a result of the financial crisis that started in 2009 and is still affecting the economy) (Scanlon, Lunde, & Whitehead, 2011). Thus, reducing building costs will be critical to tackling the shortage of social housing, especially given that the provision of extra social housing occurs mainly through new buildings – among the total of 60,630 affordable homes provided in England in 2010-11, 88.04% were new buildings[43].

Second, both Hills (2007) and MP Jack Dromey point out an imperative to build 'decent' homes. Although the quality of housing in England has increased overall, social housing tenants enjoy less space per person than tenants in private housing, and also less than they did a decade ago (Hills, 2007, p. 42). Nonetheless, the overall quality and performance of social housing schemes is good when compared against private housing. The rating of 'Good performance' is based on the Decent Homes

[40] *U.K. Pushes 'Social' Housing REIT Plan* by Anita Likus, Wall Street Journal, 9 May 2012.
[41] Housing relates to the provision of homes by private and public owners alike. As a narrower segment, social housing refers to rental housing that is owned either (1) by the state, (2) by a non-profit organisation or (3) by a combination of the two (http://www.housing.org.uk/about_us.aspx; retrieved on 10 December 2011).
[42] http://www.bbc.co.uk/news/uk-politics-15810966 (retrieved on 20 December 2011).
[43] *Affordable Housing Supply, England, 2010-11*. London: Homes and Communities Agency, 2012.

programme, which provides a comprehensive set of quality indicators (e.g. facilities, age of the building and heating system)[44]. Hence, social housing projects represent a benchmark for building quality to be followed across an industry with a record of low innovation and effectiveness (Smyth & Pryke, 2008).

Of particular interest is environmental sustainability performance. In-built environmental sustainability is paramount if the 2050 target of an 80% reduction in housing carbon emissions is to be achieved in the UK[45]. Environmental sustainability is also a key quality indicator for social housing. For the quarter between July and September of 2001, the average energy efficiency rating for new homes was 79.7 (out 100) in England. Clearly, environmental sustainability is important for social housing providers. In what could be used as a benchmark, Hills (2007, p. 67) argues that the social sector standard, when compared to the 'decent home standard', is a relatively better (or, rather, less poor) standard for the energy efficiency of buildings.

In summary, the building industry is an appropriate setting in which to study the coordination of inter-organisational relationships. Despite the industry's significant social and economic value, its track record of low effectiveness and its limited innovativeness, management research is yet to engage with it. Furthermore, I argue that this is an opportunity to engage management research with broader societal issues: the social housing shortage and building sustainability

3.2. Inductive Research Design

I built on my theoretical framework and analysis of the industry context to develop a research design that addresses how inter-organisational relationships are coordinated and where coordination problems come from. Given the scarcity of prior research on the actual coordination of inter-organisational relationships, I have implemented an inductive research design whereby I aim to derive constructs and theoretical propositions from the in-depth analysis of cases (Bauer & Gaskell, 2000; Miles & Huberman, 1984; Strauss & Corbin, 1990). My research design entailed an exploratory stage followed by a multiple case-study of seven social housing projects (Eisenhardt, 1989).

[44] *A Decent Home: Definition and guidance for implementation - June 2006/Update*. London: Department for Communities and Local Government, 2006.
[45] *Low Carbon Construction Innovation & Growth Team*. London: H M Government, 2010.

3.2.1. Exploratory Stage

I started I started with an exploratory stage that consisted of 23 interviews with experts and extensive access to the trade press. My aim was to gain an *ad hoc* understanding of the UK's building industry and the extent to which my research interest resonated with the industry.

I approached potential interviewees at trade fairs (e.g. Ecobuild[46]) and showcases (e.g. Showcase of Sports Buildings at Surrey Sport Centre). This represented an important resource. To introduce my research project to practitioners, my strategy was to design a research project brief (**Appendix 1.3**), which I handed out to potential interviewees on various occasions. I received mixed reactions. Some potential interviewees, such as a director of a UK private real estate developer, had 'no time for this!' In contrast, others were encouraging: 'you have chosen an important subject for your PhD and your research could contribute to the work that is going on right now to improve performance in the construction industry' (EI#10; CEO, main contractor). I added this endorsement to my project brief in the hope of engaging with other practitioners.

Following prior research (Eccles, 1981; Provan & Milward, 1995), I used snowball effect techniques to identify potential interviewees. The abovementioned director of a main contractor (EI#10; CEO, main contractor) introduced me to one of their clients (EI#7; environmental sustainability manager). This interviewee was important to my research as he was responsible for contracting building work at his organisation. The snowball techniques also allowed me to build a personal network within the industry. The interviewees became the interlocutors of my research.

In total, I conducted 23 semi-structured interviews with experts – researchers and practitioners – in the UK's building industry between December of 2009 and June of 2010 (**Appendix 1.4**). Interviewed practitioners included main contractors (EI#10, CEO, main contractor; EI#11, Head of Strategy and Sustainable Development), architects (EI#3; founder of architecture firm), policy-makers engaged in the building industry (EI#4; director of professional association), private clients (EI#18; a household) and public clients (EI#23; the elected member of a local council). Each of the interviewees conveyed unique perspectives within the building industry by emphasising specific issues. For instance, one architect (EI#3; founder of

[46] Ecobuild is the world's biggest trade show for sustainable design, construction and the built environment. (Further information can be found at http://www.ecobuild.co.uk/index.html.)

architecture firm) emphasised the conflict that can occur among different organisations working on a building project. This was in line with the account of a 'tremendous amount of friction' given by Scott (2003). I also interviewed researchers, who drew my attention to a wide range of research interests regarding the building industry. One professor and lecturer on project management (EI#2; Senior Lecturer) emphasised the complexity of contractual arrangements among organisations working on building projects. Another interviewee (EI#21; Professor of Information Systems) was keen on the link between my interest in inter-organisational relationships and his use of social network analysis to study relationships among design team members (not organisations).

My decision to conduct exploratory interviews is consistent with the strategies of other researchers who have used such interviews to access information about various industry settings, including building (Eccles, 1981) and telecommunications (Davis & Eisenhardt, 2011). Acknowledging the differences and complementarities among the participants, I adopted different interview guides for practitioners and researchers (**Appendixes 1.5.A** and **1.5.B**). By doing so, I intended to translate my research interest into the vocabulary used in academia and in the building industry. This was important for engaging the interviewees in my research and gathering rich accounts (Bauer & Gaskell, 2000; Miles & Huberman, 1984). I recorded the interviews whenever the interviewees allowed it. Recording was done using an Olympus VN 5500PC digital voice recorder. The interviews were transcribed within 48 hours to reduce bias (Ozcan & Eisenhardt, 2009).

In sum, the exploratory stage allowed me to familiarise myself with the empirical setting and fine-tune my research design before implementing a multiple case study.

3.2.2. Theory-Building Stage: Multiple case-study

In the second stage, theory-building, my research design entailed a multiple case-study design. Here, I justify the research design and the selection criteria for seven social housing projects, completed between 2008 and 2011 in England.

Inductive reasoning is widely discussed in the methodology literature, for example in relation to grounded theory (Glaser & Strauss, 1967), the single case study (Yin, 1994) and the multiple case-study approach (Eisenhardt, 1989). Although different, these methodological approaches within the category of inductive methods

are tied to a common goal: to develop novel insights in areas where the theory is still undeveloped, through theory-building.

I argue that the multiple case-study approach was an appropriate research design, given the research aims of building theory on the coordination of inter-organisational relationships. First, a research design using multiple cases is useful whenever the researcher intends to understand the applicability of process questions and boundary conditions to new settings (Eisenhardt, 1989; Leonard-Barton, 1990). In my study, I aimed to understand the applicability of insights developed elsewhere in the literature about the coordination of inter-organisational relationships. A similar rationale has been used to justify the choice of a multiple case-study design to study, for example, high-performance alliance portfolios (Ozcan & Eisenhardt, 2009) and social capital dynamics among biotechnology start-ups (Maurer & Ebers, 2006).

Second, my choice of methodology is aligned to dealing with under-studied phenomena in the context of inter-organisational relationships. Human and Provan (1997) conducted a multiple case study to study effectiveness within Kentucky (USA) wood manufacturers' networks of small and medium-sized enterprises (SMEs). The authors argue (1997, p. 371) that, because there is 'so little comparative empirical research on SME networks and because the research on other types of networks has limited generalizability, the multiple-case study method is justified'. The multiple case-study approach hinges on a logic of 'independent experiments' typically associated with more generalisable findings (Eisenhardt & Graebner, 2007).

Last but not least, Koza and Lewin (2004) concluded that the multiple case-study approach met the *modus operandi* of the SNA in their study of the co-evolution of network alliances. It captured multiple interactions occurring simultaneously in a single network without losing individual elements of the phenomena. In line with prior research (Ozcan & Eisenhardt, 2009), I found the multiple case-study approach to be particularly useful for the simultaneous study of the structure (e.g. network centrality) and the content (e.g. goodwill) of inter-organisational relationships. Furthermore, using multiple case studies blended with the processual studies that grounded my research on how inter-organisational relationships are coordinated.

3.2.2.1. Case Selection Criteria

The principle of theoretical sampling, where cases are selected for theoretical reasons, not random ones, assisted my case selection (Glaser & Strauss, 1967). In

this approach, ‘cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs’ (Eisenhardt & Graebner, 2007, p. 27). In addition, selection criteria were implemented to tease out exogenous effects (Eisenhardt, 1989), such as project typology and the procurement route. These are potential sources of exogenous variability highlighted during the exploratory interviews and my reading of the literature.

First, I looked at seven building projects because they allowed me to track and compare the dynamics of inter-organisational relationships and the unfolding of coordination over time. One of the advantages of this approach was to combine retrospective and real-time research across several cases studies (Leonard-Barton, 1990; Miller, Cardinal, & Glick, 1997) and to study the configuration of inter-organisational relationships from the start to the end of each project. Theoretically, this was critical because it allowed me to explore the coordination process over time and therefore develop processual explanations of the consequences of coordination among organisations. These projects combined an ambition to deliver greener buildings while keeping the building costs low. They represented an opportunity to explore aspects of innovation within the limits of constrained resources.

Second, I focused on the population of social housing projects – following my research interests – in the East Midlands, where the shortage of social housing is pronounced (Hills, 2007). By focusing on a specific geographic area, I was able to ‘control for’ extraneous variations and specify generalisable properties of the findings (Eisenhardt, 1989). I selected projects of a similar size, favouring small construction projects, in order to aid comparability across cases. I defined small projects as follows: building costs under £3 Million; design and build life-cycle no longer than 24 months (2 years); no more than 60 organisations involved. The similarities in the types and sizes of the projects ensured that the building materials and techniques were identical across the cases (Hillebrandt, 1984; Morton, 2002).

Finally, current research consistently shows that procurement routes (i.e. contract arrangements used to appoint the design team and the main contractor) shape inter-organisational relationships (Gann, 1991; Smyth & Pryke, 2008). The importance of the procurement route was confirmed by a Bid Sustainability Manager at one of the UK’s largest main contractors (EI#12; Bid Sustainability Manager), who warned me that ‘[collaboration] depends on the type of contract, whether it’s single-stage or two-stage’. A *single-stage* contract is one in which the client tenders for design and

building as a *lump-sum*, while a *two-stage* contract is one in which the client tenders for the design and building separately.

3.2.2.2.Case Profiles

The multiple case-study research design comprised seven case studies of social housing projects completed between 2008 and 2011 in the East Midlands (e.g. Corby and Leicester). I named each case study after the street addresses.

My selection of the seven cases followed prior research on inter-organisational relationships that used multiple case studies. For instance, Davis and Eisenhardt (2011) reported on eight cases of technology collaborations, while Ozcan and Eisenhardt (2009) studied six cases of entrepreneurial game publishers. Although there is no recommendation about the number of cases to be used, a large number is thought to weaken the richness of the data in terms of 'context' and 'process' (Pettigrew, 1990; van de Ven & Huber, 1990). Furthermore, Pettigrew (1990, p. 276) suggests that between four and six cases is ideal for longitudinal research (over a three-year period).

As shown in **Table 6**, the building projects ranged from the transformation of a former Air Cadet Force base (Case#2), a former colliery village (Case#3) and brown field sites[47] (e.g. Cases #1 and #7). The case profiles reflected my selection criteria; the seven projects were of small size, with low building costs, short design and build life-cycles, and few organisations engaged in the life-cycle.

The average construction cost was around £1.8 Million (mean = £1,849,481.00; SD = £900,627.80). On average, the design and build life-cycle lasted for around 15 months (mean = 14.57; SD = 5.62) and involved an average of 40 organisations in each building project (mean = 39.43; SD = 13.46) (**Table 6**).

All seven projects were procured through a design and build arrangement. When taken together, the selection criteria fulfilled an important goal, namely creating a research setting where exogenous influences (e.g. size of projects, procurement route and contracting strategies) were largely controlled across cases. Such a degree of control is often difficult to achieve in large and complex empirical settings such as in the building industry (Eccles, 1981; Smyth & Pryke, 2008; Soda & Usai, 1999).

[47] Brown field sites are farming land that can be built on (according to local planning laws).

Table 6 Case Profiles

1. Case	2. Case background	3. Building project	4. Organisations	5. Design and build life-cycle
Dale Lane Road (Case#1)	The site is in a residential area that has a mix of late 1980s and 1990s new build houses together with a range of semis and terraced properties from the early 1900s. There is a mixed tenure housing composition in the area, ranging from local authority housing stock, to privately rented dwellings and owner-occupied properties. The development site is a former hotel, now demolished and cleared, and consists of a surfaced car parking area of 0.55 acres.	Project specifications: 6 x 3-bedroom 5-person houses; 3 x 2-bed 3-person apartments; 3 x 3-bed 5-person houses; 3 x 2-bed 3-person apartments; 3 x 1-bed 2-person apartments Building Cost: £1,449,363	40 organisations	April 2008 – May 2009
Fulmar Road (Case#2)	A former Air Cadet Force base, which was purchased by the main contractor for affordable housing development in 2008. Due to claw-back provisions in the marketing particulars for any uplift in site value, it was deemed suitable for affordable housing delivery only. The site was offered to the client, subject to planning, on the basis that the main contractor would build the scheme on a Development Agreement basis.	Project specifications: 2 x 4-bed 6-person houses; 6 x 3-bed 5-person houses; 14 x 2-bed 4-person houses Building Cost: £2,263,532	55 organisations	June 2009 – February 2011
North Wingfield (Case#3)	North Wingfield is a large former colliery village in the county of Derbyshire, situated to the south-east of Chesterfield, and to the north-east of Clay Cross. This was a two-plot development. The first site is a former residential area. The second site is in the same area, on the main road into Chesterfield, and is in close proximity to shops, a community and medical centres.	Project specifications: 30 x 2-bed 3-person bungalows; 100% parking provision; 2 bungalows with car ports Building Cost: £3,087,711	58 organisations	January 2008 – December 2009
Rowlett Road (Case#4)	The site is in a large, busy residential close to a local school. Served by a regular bus service, the site is within walking distance of local amenities, including a post office, a small precinct of shops and churches. The local council team has been closely involved in establishing the scheme mix, which reflects the current demand for affordable housing and the council's strategy of widening the range of properties for sale in the town by encouraging the development of apartments and larger three and four-bed family dwellings.	Project specifications: 2 x 2-bed 3-person apartments; 2 x 2-bed 4-person houses; 1 x 3-bed 5-person house; 4 x 4-bed 6-person house; 4 x 2-bed 3-person apartments; 1 x 2-bed 4-person houses; 1 x 3-bed 5-person houses; 3 x 4-bed 6-person houses; 2 x 2-bed 3-person apartments; 1 x 3-bed 5-person house; 6 x 4-bed 6-person houses Building Cost: £2,780,000	23 organisations	August 2008 – August 2009

(Table continues on next page)

Blyth Court (Case#5)	Blyth Court was a 3-storey complex containing 35 dwellings; the tenants were mostly older persons. Refurbishment was requested to include the conversion of the bedsits into larger accommodation and a consequent reduction in total number. Consideration was also given to producing dwellings suitable for disabled persons. The newly renovated bungalows are provided with lifts, a dining room, a laundry, guest facilities, and a community centre	Project specifications: 18 x 1-bed flats; 10 x 2-bed flats Building Cost: £1,715,234	44 organisations	April 2009 and November 2010
Oakley Road (Case#6)	The plot of land at Oakley Road was brought to the client by the local council. The Environment Agency (EA) objected to the project twice because of a high risk of flooding. Final approval was granted after the client raised the ground floor levels in the building. This scheme resulted from a partnership between a social housing provider and Northamptonshire Women's Aid. It fills a gap in terms of the social response for women fleeing domestic violence caused by the closure of a women's refuge in 2000.	Project specifications: 18 x 1-bed flats; 10 x 2-bed flats Building Cost: £1,715,234	44 organisations	October 2008 – September 2009
Washbrook Road (Case#7)	The site is in a semi-rural location and is adjacent to a pleasant park. The site falls within an established residential area, with a small area of woodland to the immediate east of the site. The site was introduced to the client by a local building company, who was also retained as the main contractor to build the scheme. The client's offer for purchase was unconditional.	Project specifications: 24 x 2-bed apartments Building Cost: £725,000	36 organisations	April 2009 – January 2010

Synthesis of the Case Profiles		
A. Building costs	**B. Length of design and build life-cycle**	**C. Number of organisations**
Mean = £1,849,481.00 SD = £900,627.80	Mean = 14.57 (≈15) months SD = 5.62 (≈6) months	Mean = 39.43 (≈40) organisations SD = 13.46 (≈13) organisations

Regarding environmental sustainability targets, six out of the seven building projects aimed at Level 3 of the Code for Sustainable Homes (CfSH) or equivalent, which is regarded as a benchmark compared to similar buildings that have been developed privately (Hills, 2007). Level 3 demands an energy efficiency of 25%, which is part of the energy performance assessment that leads to the issuance of an Energy Performance Certificate (EPC) for a building. The North Wingfield project aims at Level 4 of the CfSH which demands an energy efficiency of at least 44%[48].

Overall, the seven cases were sufficiently diverse to explore the theoretical underpinnings of the coordination of inter-organisational relationships while the sources of extraneous variations were 'controlled for' to ensure validity.

3.3. Data Sources

I gathered extensive data; this was made possible due to privileged access to over 3,900 pages of minutes of meetings, project reports and interviews. Given that the coordination of inter-organisational relationships is a multifaceted phenomenon, I combined primary data sources (data I collected) and secondary data sources (data available elsewhere). This approach is consistent with the canons of inductive research (Eisenhardt, 1989; Glaser & Strauss, 1967; Miles & Huberman, 1984).

3.3.1. Primary Sources

I used the following primary data sources: face-to-face interviews; emails and phone calls; and visited trade fairs and academic conferences. Uzzi (1997, p. 38) suggests in his study of inter-organisational relationships in the New York apparel industry, that field methods were 'advantageous here because they [field methods] provided rich data for theorizing and conducting detailed analysis of the interfirm ties dynamics'. I used primary data sources mainly to cross-validate information available from secondary sources and minimise the risk of 'faulty *post hoc* attributions' from secondary data (Miller et al., 1997, p. 189) (**Table 7**).

Face-to-face interviews were conducted with several project participants. Because of the richness of information gathered during the exploratory stage, I had already gained a fairly solid understanding of the building industry by the time I

[48] The CSH measures energy/CO2, water, materials, surface water run-off, waste, pollution, health and well-being, management, and ecology.

started the data collection process for the seven case studies in the following stage. I conducted interviews with project participants whilst I was analysing other data sources (**Appendix 1.6**). These interviews were about aspects of the projects that were not clear to me from the project documentation. I travelled to organisations' offices to conduct interviews. Nonetheless, the social interaction between myself, the researcher, and the interviewees often were an informal conversation at the local pub.

The temporal distance[49] from events was an advantage because it allowed the interviewees to demarcate their views from the 'heat of the moment'. For instance, in Dale Lane (Case#1), the client and the main contractor were in disagreement following the imminent failure to achieve Secured by Design (SbD) certification for the building; this is certification that is issued by the local police regarding safety against burglary. Conducting the interviews after project completion was an advantage in addressing judgment bias (Fischhoff, 1975). I did notice, however, that the interviewees often had difficulty recalling specific episodes of the building projects. As Weick (1995, p. 29) notes, 'people are mindful only of a handful of projects at a time'. I overcame this potential bias by preparing a summary of the events for the interviewees; this enhanced their information retrieval.

Emails and phone calls were important for two reasons: the geographic dispersion of the organisations across the UK, and the validation of information from other data sources. Email exchanges and phone calls were a viable alternative to being there in person (**Table 7**).

The building projects were all based in the East Midlands but every project (i.e. case) had inputs from organisations based elsewhere in the UK, as is characteristic of the building industry (Grandori, 1997b; Jones et al., 1997; Smyth & Pryke, 2008). Some individuals had moved on to other companies (or even other countries) and travelling across the UK was not feasible due to resource constraints.

I also used emails and phone calls to validate data and seek additional information about specific episodes during the building project. For instance, for the Dale Lane (Case#1), a local police officer was very helpful in answering my emails regarding the SbD certification (which this project failed to achieve). Other questions included the use of certain acronyms as part of industry-standard terminology. The minutes of

[49] The temporal distance varied from around two years (Case#1) to zero (Case#2). Thus, I combined retrospective and real-time research (Leonard-Barton, 1990).

meetings often contained acronyms and abbreviations that were unclear to me (e.g. SHP - Social Housing Partnerships).

Trade fairs[50] and academic conferences were opportunities to combine insights from practitioners and researchers (see **Appendix 1.7**).

Trade fairs and seminars allowed me to learn about debates relevant to practitioners. For instance, the NLA/CABE[51] breakfast seminar 'Simpler and Better - Housing design in everyone's interest' was an important opportunity for me to understand the imperative – as portrayed in the event – to address the challenge of combining quality and price in the UK's housing sector. An architect expressed her concerns about the poor collaboration with home-builders regarding efficient building solutions. I also benefited from attending Ecobuild (2009, 2010 and 2011).

Academic conferences were also important venues as they allowed me to showcase, but more importantly, to develop my research project. I submitted preliminary data analysis to academic conferences and had the opportunity to integrate feedback across various perspectives, such as management (e.g. Annual Meeting of the Academy of Management – AoM), organisational studies (e.g. Annual Conference of the European Group of Organizational Studies – EGOS), and construction management and economics (e.g. a workshop at the Copenhagen Business School). Another important conference for my research was SUNBELT – the world's largest conference on social network analysis – where I presented implications for theory-building in research design combining multiple case studies and the SNA (Oliveira, 2011). At this event, I took the opportunity to acquire insights on methodological techniques for social network analysis by taking part in a capability-building workshop and discussing my research with academics.

[50] Trade fairs and conferences have been used in prior research as they are venues where various actors from an industry convene, allowing researchers to gather information about key debates (see e.g. Ansari & Phillips, 2011; Human & Provan, 1997).

[51] NLA- New London Architecture and is independent forum for debate urban architecture; CABE - Commission for Architecture and the Built Environment acts as government's advisor on issues of architecture, urban design and public space.

Table 7 Data Sources

1. Type	2. Sources	3. Description	4. How did I get access?	5. How did I use the data in this study?	6. Disadvantages	7. Advantages
Primary	Face-to-face interviews (47 pages)	Project participants were interviewed. Some interviews were conducted at organisations' offices, others at local pubs	- I identified project participants based on minutes of meetings and project directories; - I also used referrals from other project participants. In one case, the manager of one organisation introduced me to project managers and quantity surveyors via email.	- To confirm information about specific episodes in the project; - To avoid 'faulty *post hoc* attributions'.	- Individuals' retrieval of information was affected by the temporal gap and participation in multiple projects simultaneously.	- Interviews provided documented accounts from the project participants, with information about specific episodes.
	Emails and phone calls (15 pages of notes)	Emails and phones calls (between 5mins and 20 mins)	- Project directories contained the contact details of organisations and individuals. I sent an email introducing my research project and asking for their co-operation in answering some specific questions.	- To access relevant informants, geographically dispersed throughout the UK; - To validate information accessed through other data sources – i.e. triangulation of data sources.	- I often felt that interviewees could not remember some episodes of the build projects.	- Emails and phone calls were an economic means of communication since the respondents were geographically dispersed across the UK.
	Trade fairs and academic conferences (80 pages)	Trade conferences and workshops Academic conferences (e.g. EGOS and AoM)	- I signed up for major trade fairs (e.g. Ecobuild); - I submitted early versions of my work to academic conferences, specifically, doctoral workshops.	- To identify ongoing debates and concerns among communities of practitioners and researchers alike; - To articulate insights from various fields of research (e.g. organisation studies); - To benefit from methodology-related advice.	- Because these were mostly trade fairs, the potential interviewees had little time to engage with my research.	- By attending trade fairs and workshops I learnt about the debates most relevant to the building industry – e.g. cost reduction; - Academic conferences were a venue of fruitful discussions with researchers and fellow doctoral students alike.

(Table continues on next page)

Secondary	Minutes of monthly meetings (1,700 pages)	Minutes of monthly meetings containing detailed narratives of each inter-organisational relationship	- I collected minutes of monthly meetings directly from the clients and their consultants. They were sent to me electronically; - In some cases, the minutes of meetings were in electronic form (.doc. and .pdf formats). In other cases, I received digitally scanned versions of the actual minutes of meetings (paper versions circulated during the meeting with handwritten annotations).	- To access detailed narratives of the case stories with chronological organisational accounts of the coordination among organisations throughout the design and build life-cycle.	- It did not provide me with much detail about the tasks that each organisation performed individually. Although some information is lacking, this does not impact negatively on thehis study since the focus is on coordination at the inter-organisational level (as opposed to intra-organisational).	- The minutes of meetings were a good alternative for gathering social network data compared to questionnaires and (publically available) databases; - They provided detailed accounts of inter-organisational relationships.
	Progress reports and memos (1,900 pages)	Progress reports and memos (from meetings held on-site).	- I collected this information from the clients and their consultants. All information was gathered in electronic format.	- To complement the information from the minutes of meetings, as well as from the primary data sources (e.g. interviews).	- Required familiarisation with terms (e.g. acronyms) and visual representations (e.g. Gantt charts and drawings) used in the building industry.	- Extensive information about the projects' progress - This was used by the organisations to coordinate their work.
	Trade press (200 pages)	- Online publications (e.g. BUILDING.CO.UK and Construction News); - Newsletters of professional bodies (e.g. RIBA).	- Regular access to online publications; - I signed up for newsletters published by professional bodies.	- To gather initial information about the building industry, mostly in the exploratory stage; - Complementary perspective to the internal data sources (e.g. project reports and minutes of meetings).	- Politically charged views within the building industry. This aspect was an advantage in the pursuit of my research.	- Up-to-date information about the building industry and ongoing debates

Main data sources for my study

3.3.2. Secondary Sources

The secondary data sources entailed over 3,900 pages of minutes of meetings, progress reports, memos and the trade press. These contributed to the richness and uniqueness of my data; reports and memoranda are important data sources about organisations and inter-organisational relationships.

The minutes of monthly meetings formed one of the most important data sources of this study (**Table 7**). The minutes registered detailed narratives of the coordination of inter-organisational relationships, documented in over 1,700 pages (Grandori, 1997b; Jarzabkowski & Seidl, 2008; van de Ven & Poole, 2005). Such detail gave an advantage over traditional methods of data collection and analysis about social networks, such as questionnaires and databases. (I shall develop this argument in more detail in the following section.)

Access to the minutes of meetings was a key advantage in conducting a longitudinal analysis of the inter-organisational relationships. The meetings were held monthly between the main organisations in each project (e.g. clients, main contractors and architects). I gathered the minutes of meetings across the seven cases for the entire design and build life-cycle. The minutes of meetings provided information about the inter-organisational relationships such as the functions performed and organisations involved (Grandori, 1997b). I collected the minutes of meetings directly from the clients and their agents. Sometimes I obtained digitally scanned versions of actual hard copies of minutes circulated in the meetings, containing handwritten amendments related to the coordination of tasks among the organisations (**Appendix 1.6**).

Progress reports and memos also provided rich data sources. I gathered over 1,900 progress meeting reports that were issued monthly by the main contractors in the projects. The aim of these was to provide updates on the progress on-site (against the schedule of works) and state the role of various project participants – specifically sub-contractors. Memos can be more sporadic; these were generally the notes from unplanned meetings that occurred on-site or technical notes on equipment or design features. In Blyth Court (Case#5), a misspecification on the design of a structural steel frame required an urgent meeting on-site to prevent delays.

I used the progress reports and memos to complement the minutes of meetings as they provided extensive information about the projects' progress. This was the same

information that was used by the organisations to assess and direct the coordination of their inter-organisational relationships during the design and build life-cycle. For instance, every project report contained information about the progress on site against the scheduled works. Clients' agents and main contractors used this information to draw up strategies for coordination with sub-contractors so as to compensate for any delays to the work on site.

The ***trade press*** offered an up-to-date source of information about the building industry. For the theory-building, the trade press coverage offered a complementary view to that obtained from internal data sources (e.g. project reports) as some of the cases received media coverage (Case#3 and Case#5). Hence, tensions among organisations that were registered in the minutes of meetings were balanced by the narratives, typically told as success stories, in the trade press. Consider the North Wingfield (Case#3). In a trade newsletter, an organisation claimed 'a reputation for building some of the greenest homes' and described this project as 'ground-breaking in terms of use of eco-technology' (RD01-Case#3). Meanwhile, the minutes reported coordination problems concerning the installation of the biomass system.

Additionally, I regularly read BUILDING.CO.UK (the UK's leading magazine for construction professionals) and Construction News (which gives information about new projects and building technology). I also kept up-to-date by signing up for e-newsletters from two professional bodies and policy makers: the BRE – British Research Establishment (the world's leading design and assessment method for sustainable buildings) and Constructing Excellence (the organisation charged with driving the change agenda in the construction industry). These sources were important as they helped me to gain a sense of the concerns and discussions among professionals and to learn the common language used in the industry. It should be noted, as a point of caution, however, that some of the discussions aimed at triggering policy-making. This meant that often the perspective depicted among the different sources was politically charged. While some organisations aligned themselves with the government's policy, for instance, regarding funding the installation of solar panels in households, other organisations were clearly against it. I felt that such a variety of opinions enriched my study, though.

In brief, I relied on extensive data that entailed over 3,900 pages of primary and secondary data sources. My data analysis draws on the richness of the data.

3.3.3. Discovering How the Minutes of Meetings Could be Used to Study Dynamic Inter-Organisational Relationships

I argue that the minutes of meetings provide an opportunity to develop an in-depth approach to mapping inter-organisational relationships. My view is based on my own assessment of the data sources used in previous research on inter-organisational relationships – that lacks despite an exponential growth of SNA research (Borgatti & Foster, 2003) – organised around my research questions.

There are just a few exceptions, to the best of my knowledge. Oliver and Ebers (1998), Provan et al. (2007) and Tichy et al. (1979) all dedicate commentaries in their reviews of the SNA to the assessment of data sources. However, in the absence of a *systemic assessment* of data sources about inter-organisational relationships, I felt the need to conduct my own assessment of the advantages and disadvantages of the key data sources used in prior research: questionnaires, datasets and interviews[52]. The criteria for my assessment were, of course, defined by my research interests. **Table 8** summarises this assessment across two dimensions: complete configurations and longitudinal observations[53].

Questionnaires feature among the most commonly used data collection methods in SNA research (Oliver & Ebers, 1998; Provan et al., 2007). Questionnaires involve asking individuals to report on their interactions with other organisations (Tichy et al., 1979). Individuals are presented with a list of all organisations involved in a given project or venture. Such lists are an advantage when studying complete configurations. They reduce the likelihood of respondents failing to remember all the organisations that took part, which is more likely to occur when a study is dealing with past events, due to respondents' information retrieval limitations. Another advantage of the questionnaire is the possibility of gathering additional information on, for example, organisational expertise. However, this strategy requires the researchers to have *ex ante* knowledge of all the organisations that took part so that they can generate a complete list. For instance, in a study of inter-organisational

[52] I acknowledge that researchers often combine different data sources, such as databases and questionnaires (e.g. McEvily & Zaheer, 1999). In my assessment, I concentrated on the main data source used in each study of inter-organisational relationships.

[53] A complete configuration refers to the entire set of ties engaged in a project. As Walker et al. (1997, p. 122) posit, 'the study of interfirm cooperative agreements over time requires an analysis of the network as a whole'. My focus is on the complete set of inter-organisational relationships instead of 'how are one organisation's dynamic inter-organisational relationships coordinated?' As for the second feature, the data is required to be longitudinal to capture the 'dynamic' aspect in my research.

coordination among fourteen early childhood agencies in Texas, van de Ven & Gordon (1984) report having used a list of all the agencies' directors so that each director could indicate their inter-organisational ties. However, in retrospective studies, respondents experience difficulties in recalling all of the ties that relate to the complete configuration, which can represent a drawback of the use of questionnaires.

Questionnaires are suitable for generating standardised data at different points in time. This enhances the comparability of the data and is an advantage in longitudinal studies. However, data collected through questionnaires require that all respondents participate at all observation points. Problems arise if a respondent drops out during the research project. The lack of an answer might be regarded as a missing value but it might also indicate the cessation of a tie, knowledge of which is critical in studying inter-organisational relationships. Uncertainty about the reason for the 'disappearance' of a tie can thus be problematic to the analysis. This problem was reported by van de Ven and Gordon (1984, p. 607) in their longitudinal analysis of inter-agency relationships: it was 'complicated' because some member-agency respondents stopped participating before the end.

Databases are (often publicly available) sources of information such as lists of alliances and consortia within an industry. They are widely used in research into inter-organisational relationships, especially if the research has a macro-level focus, such as an industry (Rosenkopf & Padula, 2008; Soda & Usai, 1999) or region (McEvily & Zaheer, 1999). Research that relies on databases uses exhaustive lists of organisations and formalised inter-organisational ties. This allows the use of sophisticated statistical routines in the SNA. Soda and Usai (1999) use a database of all consortia in Italy's building industry to map inter-organisational relationships. The use of large databases is supported by the claim that it reduces 'complications', to borrow the language of van de Ven and Gordon (1984, p. 607). Databases allow a large sample size to be used, which reduces the likelihood of bias. (Gulati, 1995b) uses a database containing over 2,400 alliances to study how social structure affects patterns of alliance formation. Nonetheless, the datasets in such studies are often limited to information on dyads (pairs of organisations). The focus on dyads is understood to be a limitation because organisations are in fact embedded in extensive networks comprising several organisations (Gulati, 1995b, p. 645).

Compared to questionnaires, databases are a reliable source of information on the entry and exit of organisations to and from a network. This feature is central for

longitudinal studies concerning highly dynamic settings, for instance, the biotechnology industry (Powell et al., 1996) or ties among venture capitalists and entrepreneurs (Hallen, 2008). Databases enable the retrospective study of long time-spans. For instance, Gulati (1995b) uses a database to study patterns of alliances over a period of 20 years (1970-1989). A notable exception in terms of studying complete networks using databases is Owen-Smith and Powell's (2004), wherein the authors track inter-organisational relationships in the biotechnology industry between 1988 and 1999 in the Boston area. Otherwise, research using databases seldom studies complete configurations (Zaheer et al., 2010). Another limitation is that longitudinal research to date has used databases and the analyses have been based on only standard SNA measures (Provan et al., 2007). Up until now, the use of SNA measures – for instance, organisations' centrality – was derived for databases and was rarely complemented by primary data such as interviews. Complementary qualitative data is important for unravelling the mechanisms underlying the dynamics of inter-organisational relationships. For instance, Gulati & Gargiulo (1999) integrate the use of databases with interviews in their research on the origins of inter-organisational networks. In another study, Maurer & Ebers (2006) show the relevance of interviews in unravelling the mechanisms underlying the dynamics of inter-organisational relationships among German biotechnology start-ups.

Interviews are popular. They are often guided by snowball sampling techniques within an empirical context (**Table 8**). This increases the response rate and the likelihood of capturing a complete configuration of inter-organisational relationships. The information that is gathered is enriched with narratives. Doz (1996) uses interviews to unravel the learning processes in four strategic alliances.

The data on inter-organisational relationships gathered through interviews are often analysed using content analysis rather than SNA techniques. While SNA techniques 'quantify', data from interviews 'qualify', inter-organisational relationships. Interviews are at the heart of the research designs of some of the seminal works on the social network approach (Granovetter, 1973; Uzzi, 1997). Interviews allow the researcher to unravel the 'qualities' of ties – for example, trust in embedded ties *versus* arm's-length ties. However, it is not easy to use the data collected from interviews to generate relational matrices, that is to index organisations and ties into matrices (Wasserman & Faust, 1994), upon which SNA research relies.

Table 8 Assessment of Existing Data Sources Used in Inter-Organisational Relationships Research

1. Data sources	2. Description		3. Complete configurations	4. Longitudinal observation	5. Prior research
Questionnaires	Typically, questionnaires are sent out to potential respondents along with a list of organisations. In longitudinal research, questionnaires are distributed at different observation points in time	Advantages	- Since respondents are presented with a list of organisations, no organisation is (inadvertently) left out by the respondents; - Integration of other relevant aspects, e.g. measures of task complexity and degree of centralisation.	- Standardisation of questions enhances the comparison of observations made at different points in time.	(Human & Provan, 2000; McEvily & Zaheer, 1999; Obstfeld, 2005; Schmidt & Kochan, 1977; van de Ven & Gordon, 1984)
		Disadvantages	- Respondents' withdrawals from the study reduce the completeness of the configuration; - When the study is carried out retrospectively, some respondents may experience difficulties in recalling all ties relevant to the complete configuration.	- Some respondents may drop out half-way through the study. This creates methodological concerns about the analytical treatment of the entry and exit of nodes.	
Databases (often publicly available)	This includes industry datasets, e.g. alliances and consortia.	Advantages	- Complete list of organisations, e.g. list of organisations or consortia in the building industry; - Extensiveness of the data, which reduces the 'complications' that can stem from missing data.	- Reliability of information on entry and exit of organisations, specifically in highly dynamic industries, e.g. biotechnology; - It allows retrospective studies over long time spans.	(Gulati, 1995b; Gulati & Gargiulo, 1999; Hallen, 2008; Human & Provan, 2000; Koza & Lewin, 2004; Owen-Smith & Powell, 2004; Ring & van de Ven, 1992; Rosenkopf & Padula, 2008; Soda & Usai, 1999; Walker et al., 1997)
		Disadvantages	- A focus on dyads, i.e. pairs of organisations (with a few exceptions). This is often a limitation because organisations are embedded in broader inter-organisational relationships.	- The study of the evolution of relationships is often restricted to the dynamics of dyads (or in some exceptions triads); - The reporting of dynamics relies mostly on descriptive measures but often lacks complementary data.	

(Table continues on next page)

Interviews	Researchers identify the relevant respondents (e.g. through snowball sampling techniques) to be interviewed about a given phenomenon.	Advantages	- High response rates and the study of the complete configuration of inter-organisational relationships; - Information gathered is enriched by detailed narratives about, for example, coordination-related aspects of inter-organisational relationships.	- In-depth knowledge of the dynamics of inter-organisational relationships; - It enhances the study of mechanisms (e.g. changes in the structure of a network over time). Interviews are widely used in process-driven longitudinal research.	(Argote, 1982; Davis & Eisenhardt, 2011; Doz, 1996; Gulati et al., 2011b; Hardy et al., 2003; Mariotti & Delbridge, 2012; Maurer & Ebers, 2006; Ozcan & Eisenhardt, 2009)
		Disadvantages	- Despite the richness of the data, the implementation of SNA techniques is often difficult.	- Comparability to prior research (using questionnaires and databases) is not straightforward; - Additional difficulty in conducting longitudinal analyses of the social structure of inter-organisational relationships.	
Minutes of meetings	Detailed narratives of meetings held among several parties with regards, for example, a project.	Advantages	- Detailed information on all aspects of the configuration, e.g. organisations and their functions.	- A chronologically organised record of inter-organisational interactions; - No missing data on nodes (i.e. organisations) or ties (i.e. inter-organisational relationships).	Related research: (Broniatowski, 2010; Diesner& Carley, 2012; Gibson, 2005; Jarzabkowski & Seidl, 2008; Simon, 1976; van de Ven & Poole, 2005)
		Disadvantages	- Requires manual extraction of relational data (currently, there is no computerised method is available); - No benchmarking available; - Not suitable for large-scale configurations	- Because of the enormous work involved, it is not suitable for studying long time spans.	

It denotes the main data collection method adopted for this study.

Still, using interview-based data in longitudinal studies provides in-depth accounts of the dynamics of inter-organisational relationships. Unlike questionnaire-based data, interview-based data enhance process-driven accounts of phenomena embedded in dynamic inter-organisational relationships. For instance, Ozcan and Eisenhardt (2009, p. 247) show a process framework of how entrepreneurial firms initiate high-performing portfolios. In another study, Davis and Eisenhardt (2011) use over 72 semi-structured interviews about 8 technology-oriented inter-organisational collaborations.

Recently published research on inter-organisational relationships aims to address the gaps in prior research (mainly conducted through the analysis of data obtained through questionnaires and databases). Nonetheless, the comparability of the findings is not always straightforward. Because of the difficulty of generating relational matrices with interview-gathered data, analysing the structural properties of inter-organisational relationships is difficult (**Table 8**). While the use of relational matrices allows SNA measures to be used (e.g. centrality), the use of interview-gathered data means the researcher is 'limited' to content analysis.

The minutes of meetings are, I argue, an alternative to databases, questionnaires and interviews as a data source regarding dynamic inter-organisational relationships, particularly for my study.

One reason is that minutes of meetings fulfil the data requirements that I identified for my study: complete configuration and longitudinal observations (**Table 8**). The minutes of meetings contain detailed information on all aspects of the configurations in question (e.g. organisations and their functions). Simon (1976) refers to minutes of meetings and internal documents as two of the most insightful sources of data about the 'life of organisations'. The relevance of documentation such as minutes of meetings and memos is evidenced in research on inter-organisational coordination among agencies in the state of Texas (van de Ven & Gordon, 1984). The minutes of meetings provide information on the dynamics among organisations and any concerns regarding inter-organisational arrangements. Moreover, minutes are a key data source in strategy research (Dittrich, Guerard, & Seidl, 2011; Gibson, 2005; Jarzabkowski & Seidl, 2008; van de Ven & Poole, 2005). In a rare study using meetings to study networks of individuals, Gibson[54] (2005)

[54] I thank Martin Gargiulo for drawing my attention to the work of the sociologist David Gibson.

delivers a detailed analysis of the interactions (superior-subordinate, friendship and co-working) that take place in the meetings. His article ‘is perhaps the first to link statistically network-analytic and conversation-analytic levels of analysis’ (Gibson, 2005, p. 1561). Any extension of the use of the minutes of meetings to study inter-organisational relationships needs to be assessed thoroughly, however.

As far as longitudinal studies are concerned, the minutes of meetings provide a chronologically organised record of inter-organisational relationships (Broniatowski, 2010; Diesner, & Carley, 2012; Jarzabkowski & Seidl, 2008). One of the strengths of minutes is that they provide qualitative accounts as well as systematic information on the inter-organisational relationships over time. Additionally, the minutes of meetings are advantageous for the study of complete configurations of inter-organisational relationships. Information about organisational expertise and changes over time is also documented. I observed this myself in the minutes of meetings I gathered from the seven building projects. I found a great amount of detail about the functions performed by the main contractor and, more importantly, the requirements for coordination with other organisations throughout the design and build life-cycle.

Nevertheless, I acknowledge that there are a few disadvantages to the use of the minutes of meetings to study inter-organisational relationships. An enormous amount of work seems to be required if we are to study inter-organisational relationships in detail since there are no examples to follow in the current research. The minutes of meetings also have limited suitability for long time spans (e.g. over 5 years).

Still, ‘an advantage of the network approach rests with its ability to bring together quantitative, qualitative, and graphical analyses’ (Ibarra, Kilduff, & Tsai, 2005, p. 368). Following this reasoning, and given how the minutes of meetings fare in the comparison against other data sources, I argue that their use is worth pursuing when studying inter-organisational relationships.

In a nutshell, I have argued here that the minutes of meetings are particularly suitable for studying inter-organisational relationships compared to the alternatives.

3.4. Data Analysis: Developing an in-depth approach for studying coordination of inter-organisational relationships

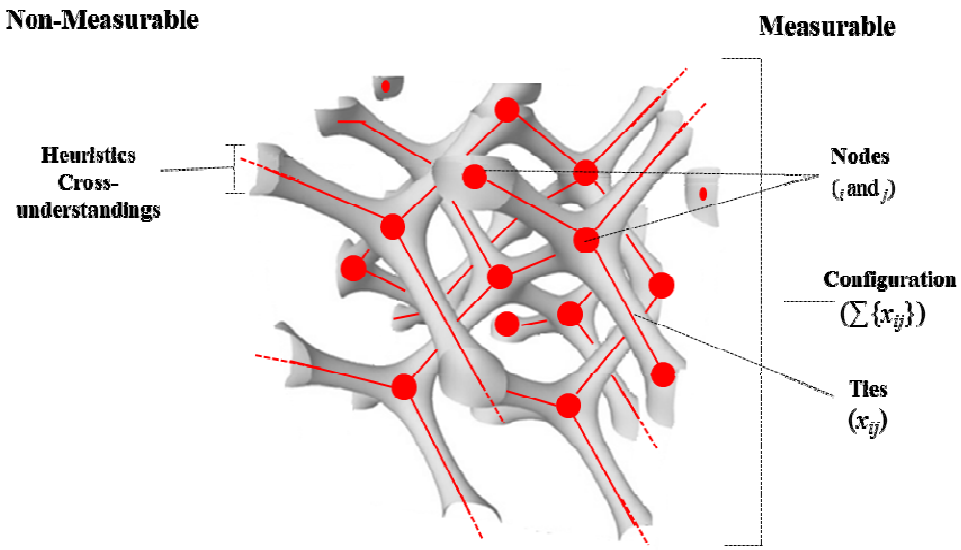
In this section, I describe the development of an in-depth approach that combines the use of the SNA to map inter-organisational relationships and content analysis techniques to examine the theoretical underpinnings of coordination and coordination problems in inter-organisational relationships over time. I first establish the relevance of developing such an approach and then move on to describe my use of (1) text-based data for the SNA and (2) content analysis.

The trigger for me to develop an in-depth methodology was the realisation that a study of the coordination of dynamic inter-organisational relationships would require a fine-grained analysis. The pursuit of answers to my research questions called for a combined study of the structure of ties among organisations and an inductive analysis of coordination based on the extensive textual material. Furthermore, this approach resonated with the call for research studying the 'network structures' and 'underlying process' in the relationships among organisations (Sydow & Windeler, 1998). In other words, the key was to combine the SNA with theoretical explanations of mechanisms within inter-organisational relationships (Emirbayer & Jeff, 1994).

Figure 9 makes the case for using an in-depth approach to examine the coordination of inter-organisational relationships. The key point is that coordination is a rich mechanism that unfolds within inter-organisational ties and cannot be captured through SNA measures alone.

Of course, SNA techniques can be used to unravel patterns of inter-organisational relationships (Galaskiewicz, 1985; Wasserman & Faust, 1994), but ties among organisations are rich in social mechanisms that cannot be captured through SNA alone. In the light of the theoretical framework of this study, there are also aspects such as trust (Gulati, 1995; Ring & van de Ven, 1992), social mechanisms of control (Hardy et al., 2005; Jones et al., 1997) and heuristics and cross-understandings (Beamish & Biggart, 2010; Kogut & Zander, 1996) to be considered. **Figure 9** is a stylised representation of these components underlying the coordination of inter-organisational relationships. The red-coloured nodes are organisations (i.e. nodes in SNA terms), but organisations' attributes, such as expertise are also involved. Along the same line of reasoning, the red-coloured ties embed other aspects, such as trust.

Figure 9 Making the Case for an In-Depth Approach to the Study of Inter-Organisational Relationships



Source: Adapted from Zumer, Ravnik, Porenta, Alexander and Yeomans (2010)

I overcame this challenge by developing a novel, in-depth, approach to inter-organisational relationships. This approach integrates (1) the SNA (Galaskiewicz, 1985; Wasserman & Faust, 1994) and (2) *traditional* inductive research (Eisenhardt, 1989; Glaser & Strauss, 1967).

3.4.1. SNA Using Text-Based Data

For this study, I developed my own approach to the SNA using text-based data in the absence of benchmarking (see, Diesner & Carley, 2012, for early steps). In a procedure that lasted over eight months, I manually extracted network data from the minutes of meetings following a stepwise procedure: (1) data extraction, (2) data cleansing, (3) data storage and (4) data analysis. Below, I explain each step and report the reliability tests on the coding.

There were some preparatory steps. First of all, I identified various *components of configurations of inter-organisational relationships*, such as nodes ($_i$ and $_j$) and ties (x_{ij}). The initial step was to specify the boundaries for all seven configurations of inter-organisational relationships (or network configurations). I defined the network configuration in relation to each social housing building project (i.e. individual case study). Therefore, the 'project' delimited the boundary of each network configuration as well as each case study. In line with prior research, I regarded the 'project' as 'a

nexus of activity that allows multiple organisations to collaborate to achieve their individual and collective goals' (Jones & Lichtenstein, 2008). A similar approach is used in prior research on the building industry. Smyth and Pryke (2008) define the boundaries of the network related to UK-based infrastructure projects.

The next step concerned the definition of the *conceptual underpinnings* as part of the preparation for extracting data; this ensured theory-data adherence. One implication of choosing the minutes of meetings to source data about inter-organisational networks was the absence of benchmarking (as I argued earlier). To overcome this hurdle, I built on current research on the extraction and treatment of text-based data. The conceptual framework developed by Carley and Palmquist (1991) as a methodology for extracting mental models from text-based data is particularly suited to my research. The overarching concept is one of a 'representation scheme', which can be regarded as the equivalent of a network configuration. The representation scheme entails two objects: concepts and relationships. A concept refers to a single word (e.g. *friend*) while a relationship refers to 'a tie linking concepts' (e.g. *loves* and *does*) (Carley & Palmquist, 1991, p. 607). Hence, the parallel to the SNA is straightforward: a concept represents one organisation's name (i.e. a node); and a relationship denotes an action performed between at least two organisations (i.e. a tie)[55]. Furthermore, the object 'relationship' is broadly associated with the notion of 'interaction', widely implemented in current research on inter-organisational relationships. Interactions are defined as activities across organisational boundaries that include 'enduring transactions, flows, and links that occur among or between organisations' (Oliver, 1990, p. 241).

A key aspect here was the reliability of the data coding procedures. I therefore conducted a pilot exercise for coding text-based data for the SNA in a different case study, with two independent raters coding the data. I provided the raters with the minutes from a meeting on the 'Melton Road' project[56] and outlined the coding criteria for them. My study of the inter-rater reliability – see **Appendix 1.8** for a detailed report – shows 'high' agreement between the raters: Cohen's Kappa (k) = .857 (confidence interval = [.804; .910]; *p-value* < .001; N = 2,600) (Landis & Koch,

[55] In the original version, Carley and Palmquist (1991, p. 607) also included two other objects as part of the representation scheme: statements and maps. Because these two objects were specific to the drawing of mental maps, I did not integrate them into the framework for this study.

[56] This social housing project was very similar to the seven projects used in the main study of this research, and detailed earlier in this chapter. The main contractor started on site in May 2008 and the handover of the building to the client took place 20 months later. The total cost was £2, 877,792.

1977). The main advantage of this pilot exercise was that it helped me to establish a detailed guide that later allowed me to code the data of the seven case studies. Based on these figures, I could expect the coding to show an inter-rater reliability of between .804 and .910, at the 95% confidence level. Furthermore, conducting a pilot exercise for the coding was the most viable option in light of the financial constraints on this research. The coding process required a generous amount of time, which would have involved the payment of high fees to the raters if they had coded all seven case studies. I now present my stepwise approach used to extract network data from text-based sources, which I improved based on the pilot study (**Table 9**).

(1) **Data extraction** entailed the extraction of social network data originally in a text format. I manually extracted inter-organisational network data from over 1,700 pages of minutes of meetings. To ensure validity and reliability, I only considered interactions documented in the minutes of the meetings. I followed this methodological procedure for all seven case studies. I used a table to store information as it was reported in the minutes (see **Appendix 1.9** for an illustration).

I started by identifying all inter-organisational relations that appeared in the minutes. That led to a list of organisations (i.e. concepts/nodes) connected through interactions (i.e. relationships/ties) (**Table 9**). For instance, 'SF met with Service 24' was registered as a relationship between two concepts. In SNA terms, Organisation A ($_i$), 'SF', and Organisation B ($_j$), 'Service 24', established a tie (x_{ij}). Besides the transcriptions, the table also registered the nodes (i.e. concepts) forming each tie (i.e. relationship); I gathered over 370 pages of tables in total. I used a stylised notation: SF→Service 24. No network configuration ($\sum\{x_{ij}\}$) could be drawn at this stage because my data were still in raw form. I simply had an inventory of all ties. Data were chronologically organised by monthly observation point (i.e. *waves*, in SNA terms). The unit of analysis for time was one 'month'.

(2) **Data cleansing** was also required. I conducted several verification processes to prevent errors. The verification processes included consistency of names of organisations (i.e. concepts/nodes) and 'double counting' (**Table 9**). Organisations were often identified by initials or even an individual's name (e.g. the initials of the manager with the main contractor). In the example above, 'SF' referred to 'Sara Fitz' (fictitious name), the project manager for the client.

Table 9 Stepwise Approach Used to Extract Social Network Data from Text-Based Sources

1. Components	2. Conceptual underpinnings	3. Data extraction	4. Data cleansing	5. Data storage	6. Data analysis
Nodes ($_i$ and $_j$) ●	All organisations engaged in each social housing project. Each organisation represented as a *concept* (Carley & Palmquist, 1991, p. 607) (or node in SNA terms).	Minutes of meetings contained references to all organisations involved in the project (i.e. concepts). I also used project directories to gather information about organisations (e.g. contacts)	I checked for the consistency of the names of organisations (i.e. concepts/nodes). In the minutes, organisations were often identified by initials or even individual's names. I generated a list of all references to nodes so that I could standardise the notion.	When it came to the inter-organisational network, I was interested in ties – relationships between at least two nodes. However, I also created an attributes file to store information on the organisations' functions.	No analysis was carried out at the node level
Ties (x_{ij}) ●-●	'Tie serves as a bond that aligns and coordinates action, enabling groups of nodes to act as a single node' (Borgatti & Halgin, 2011, p. 7). Every inter-organisational interaction was treated as a *relationship* (Carley & Palmquist, 1991, p. 607)	I manually extracted all instances of organisations (i.e. concepts/nodes) connected through interactions (i.e. relationships/ties).	'Double counting' due to the documentation of the same inter-organisational interaction in the minutes of two consecutive meetings. Once I had completed the data cleansing, there were 2,600 inter-organisational ties.	All of the ties that had previously been stored in a Word document were exported to a text file (.txt) for each month and case. Text files (.txt) were created wherein every tie was registered on one line.	UCINET 4 (Over 2,600 inter-organisational ties)
Configuration ($\sum\{x_{ij}\}$) 	A network/configuration is a 'set of nodes and the set of ties representing some relationship, or lack of relationship, between the nodes' (Brass, Galaskiewicz, Greve, & Tsai, 2004) . It is alternatively a representation schema formed by *concepts* and *relationships* (Carley & Palmquist, 1991).	At this stage, network configurations could not yet be generated. Only an inventory of all ties was produced.	Network configurations could not yet be generated.	The .txt files were converted into .dl - UCINET 4 requirements/ Using UCINET 4, I created a relational matrix given by g x g (g rows and g columns) and indexed the relationships among organisations $_i$ and $_j$ (x_{ij}), where g was the total number of organisations.	UCINET 4 (seven complete, dynamic, network configurations formed by monthly observation points).
Dynamic *Time 1...Time n+1*	Longitudinal study of the evolution of inter-organisational relationships (Gulati, 1995b; Moody, McFarland, & Bender-DeMoll, 2005).	The key information in organising the inventory of all ties longitudinally was the date.	All interactions remained organised monthly but dynamic representations could not yet be generated.	A dynamic perspective was created by a sequence of configurations according to each *wave* (e.g. *time 1*; *time n+1*).	UCINET 4 (seven complete, dynamic, network configurations; monthly points).

The grey shading represents the highest workload required across 'steps' (i.e. data extraction; data cleansing; data storage; and data analysis).

On other occasions, the actual name of the client organisation was mentioned. These were initially noted as two different nodes (i.e. concepts) although they were the same organisation. Another feature that required standardisation was the inconsistency of terms used. To address this consistently, I generated a list of all nodes so that I could standardise the notation. In this list, I included all notation (e.g. for the client, the organisation's name and the project manager's name) used to refer to the same organisation; the final inventory of ties has a unique notation.

The 'double counting' of ties referred to the documenting of the same inter-organisational interaction in the minutes of two consecutive meetings. For instance, 'double counting' occurred if the minutes for 'month *n*' stated an interaction that was also recorded in the minutes for 'month *n+1'* (as a confirmation that the interaction had taken place). These were two different references to the same interaction; therefore, I registered just one inter-organisational interaction (**Appendix 1.9**).

Similarly to in the previous step, no network configuration ($\sum\{x_{ij}\}$) could be drawn at this point. I kept the data organised chronologically by monthly observation point (i.e. *waves*, in SNA terms). The goal of the data-cleansing stage was to ensure the validity and reliability of the data analysis (mostly because it was a new method with no benchmarking). Over 2,600 inter-organisational ties had been registered at the completion of the data cleansing (**Table 9**).

(3) **Data storage** was assisted through the use of documents created in the Microsoft Word text processor (see **Appendix 1.9**). From this point on, the nodes were not studied individually; instead, I was interested in ties.

At this stage, the goal was to store the data in files that could be used to run the SNA. In order to achieve this, I exported all the ties (remaining after the data cleansing) to a text file (.txt). I created a text file for each *wave* (i.e. monthly observation point) for each of the seven network configurations. Each line of the text file represented one tie. For instance, to recall the previous example, the tie Client→Service 24 occupied one line in the text file, with the two nodes separated by a single space. The number of lines in the text file thus equalled the total number of ties (in that *wave*).

An additional step was still necessary: exporting the text data to the SNA software package. I opted for UCINET 4 (Borgatti, Everett, & Freeman, 2002), which has been used widely in prior research on inter-organisational relationships (Ahuja, Polidoro, & Mitchell, 2009; Greve et al., 2010; Polidoro et al., 2011; Soda & Usai,

1999). However, the file extension .txt had to be converted to .dl in order for the file to be imported into UCINET6 as a network file. I did this by adding the following script at the head of the text file:

dl n=[number of nodes] , format=nodelist1

row labels embedded

data:

[lines of inter-organisational interactions – for example, "Client Service 24"]

I repeated this procedure for all of the text files, that is, for each *wav*e (i.e. monthly observation point) and each of the seven network configurations. Once this task was finished, I imported the .dl text files into UCINET 4 (Borgatti et al., 2002), which automatically generated a relational matrix. This was a *g* x *g* matrix (*g* rows and *g* columns) that indexed the relationships among pairs of organisations $_i$ and $_j$ (x_{ij}), where *g* was the total number of organisations in that inter-organisational network configuration. I computed a relational matrix for all seven inter-organisational networks (**Appendix 1.9**). These inter-organisational networks were 'dynamic' because they were comprised of a sequence of *waves* (e.g. *time 1*; *time n+1*). I had a separate matrix for each month.

Additionally, I created attribute files to store information on organisational expertise. I did so in two steps. First, I used a list of all organisations for every *wave* of the configuration of inter-organisational relationships. Information on the organisational expertise of each node was sorted and stored in Microsoft Excel spreadsheets (.xls). Second, I transferred this information into a text file (.dl). Text files can be imported into UCINET 4 as attribute files (.vna) but they need to have a script '*node data' inserted in the first line (**Appendix 1.9**).

(4) **Data analysis** was the last procedure of *my stepwise approach to social network using text-based data.* From this point on, I followed standard procedures for the SNA (Borgatti et al., 2002; Wasserman & Faust, 1994). The data analysis followed the routines implemented in UCINET 4 (Borgatti et al., 2002).

I started by representing the dynamics of inter-organisational relationships as a sequence of monthly-observed graphic representations of the inter-organisational network configuration – a set of nodes and ties (Galaskiewicz, 1985; Wasserman & Faust, 1994). I used the NetDraw application available with the software package UCINET 4 (Borgatti et al., 2002) to produce graphic representations of the inter-organisational relationships. The specification of the algorithm used to generate the

graphic representation was as follows: ‘Layout / Graph–Theoretic layout / Kamada-Kawai’. The use of this algorithm was consistent with what had been done in prior research on inter-organisational relationships (Polidoro et al., 2011) (for representing joint ventures in the global chemicals industry) and representing alliances in the global liner shipping industry (Greve et al., 2010).

In total, I studied seven complete, dynamic, network configurations formed of monthly observation points. Through the discovery of the minutes of meetings as a source of social network data, as well as the ability to use the SNA with text-based data, I managed to access social network data that met my initial data requirements of complete configurations and a longitudinal study.

In sum, in this section I have shown how I developed a methodological approach to extract network data from text-based sources that allowed me to map the inter-organisational relationships in these seven cases.

3.4.2. Qualitative Analysis

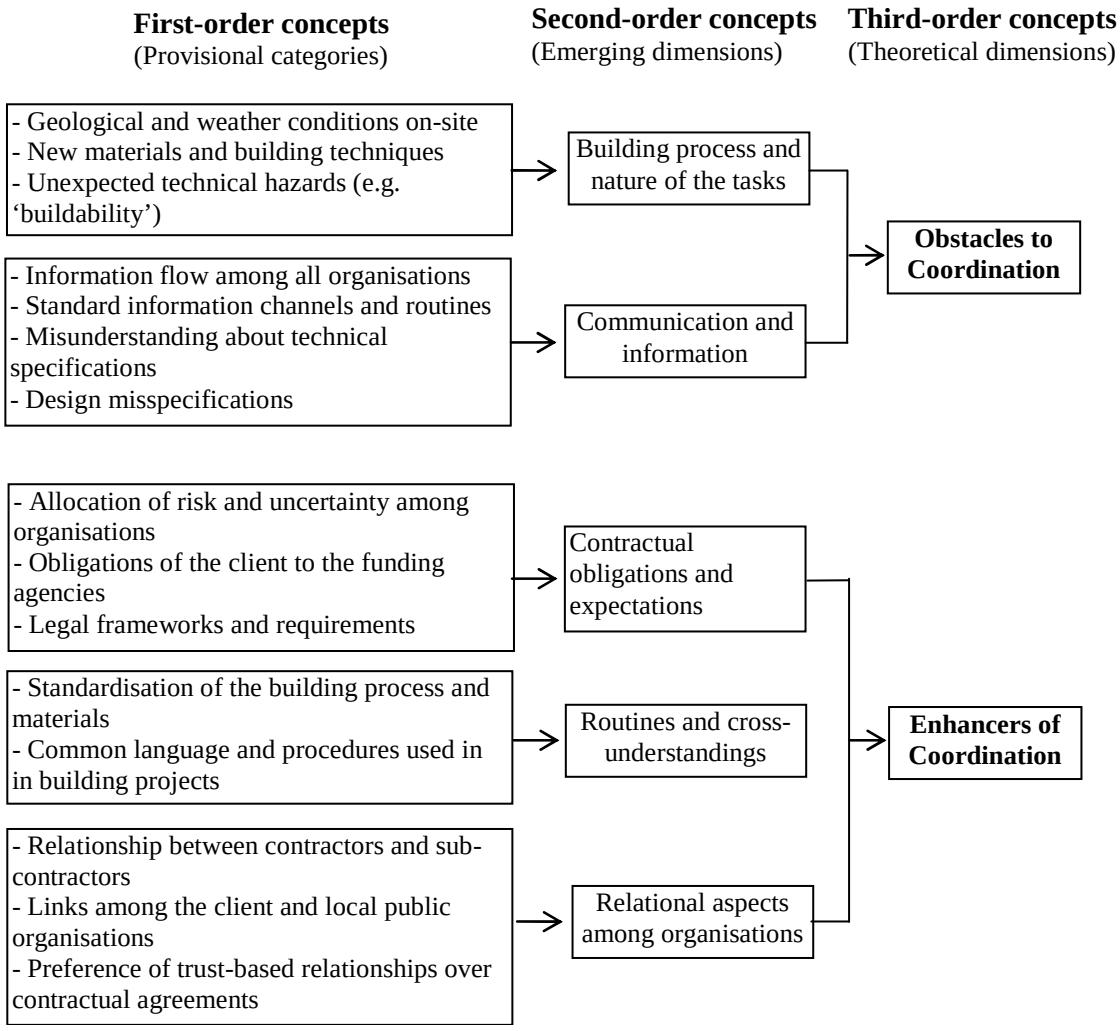
In the final part of my in-depth approach to the coordination of inter-organisational relationships, I followed the canons of inductive enquiry (Eisenhardt, 1989) and qualitative data analysis (Bauer & Gaskell, 2000; Strauss & Corbin, 1990). Essentially, I built on extensive textual data to conduct qualitative analyses that integrated with SNA of inter-organisational relationships.

I started according to the principles of an inductive research design that has been used for multiple case-study research (Eisenhardt, 1989) and in grounded theory (Glaser & Strauss, 1967). My data analysis entailed an initial process of synthesising and organising data across cases (Eisenhardt, 1989) in line with the qualitative research tradition (Miles & Huberman, 1984). I began by synthesising and organising all of the information available on the seven projects from various sources. The first step was to stitch together the individual case stories and inter-organisational networks and compile the information in tables (Eisenhardt, 1989; Miles & Huberman, 1984). In order to reflect the longitudinal aspect of my data, I organised the data chronologically across cases. Following prior research (Adler, 1995; Davis & Eisenhardt, 2011), I aggregated the data according to the stage of the design and build life-cycle. As I was reading the minutes of meetings, I made notes on coordination-related aspects and identified instances of dysfunctionalities that were reported among the organisations, such as delays and slow progress on site.

I started to make a provisional coding of the data. Data coding is an analytical procedure that entails operations that break the data down into conceptualised aspects and puts it back together in new ways (Strauss & Corbin, 1990, p. 57). I followed the open coding approach; this type of coding was suitable for my study because of its flexibility and inductive element.

I carried out the coding manually using annotations in the documents (e.g. project reports and memos). I started with a provisional 'start list' of codes based on the conceptual framework (Bauer & Gaskell, 2000; Miles & Huberman, 1984) and developed initial codes based on the theoretical framework underlying my study. **Figure 10** shows an example of content analysis based on open coding. The open coding was based on the language used in the primary data sources and secondary sources, as I specifically wanted to keep it as it was documented in the data sources.

Figure 10 Illustration of Content Analysis



I searched for relationships among the first-order concepts so as to aggregate the data to a higher order. The importance of this step was to shift from a descriptive analysis towards an analytical insight about coordination. Further attempts to group the data became progressively more interrelated with the theory in a move from descriptive to analytical categories (Eisenhardt, 1989; Miles & Huberman, 1984). The grouping criteria were determined based on the relevant literature and emerging themes (Strauss & Corbin, 1990). I made use of numerous case-pairings to identify overlaps of constructs across the seven cases. For instance, I was interested in qualitative elements of ties, such as cross-understandings.

After conducting several rounds of the above process, I reached the second-order concepts. For instance, the second-order concept 'building process and nature of the tasks' entailed aspects such as 'new materials and building techniques' and 'unexpected technical hazards (e.g. 'buildability') (**Figure 10**). This process revealed certain obstacles, for instance the use of in-built renewable energy technology in new projects from the design stage. I used grouping techniques to reveal cross-case similarities. An interactive framework started to develop, which evolved constantly as I made sense of the data. In his study of inter-firm relationships in New York's apparel industry, Uzzi (1997, p. 41) 'developed a working framework based on extant theory and then travelled back and forth between the data and [his] working framework'. I did the same by making notes and looking for emerging themes.

In the final step of the analysis, I completed the process of comparing data to theory by identifying third-order concepts. These resonated with the broader theoretical framework in my study, concerning the coordination of dynamic inter-organisational relationships. The analysis was guided by contrasting concepts across cases so that I could synthetise what was different and what was the same (Strauss & Corbin, 1990). Progressively, relationships among concepts started to bring to light explanatory paths that I 'tested' systematically across cases (Eisenhardt, 1989; Leonard-Barton, 1990). I also used triangulation from multiple data sources to strengthen emerging patterns of explanation (Jick, 1979). For instance, I made phone calls and sent emails to clarify specific episodes that were not clear in the minutes of meetings. In several instances, organisations were registered as main contractors but only the organisation's design department appeared to be involved in the project. Thus, I contacted the relevant project managers and client to establish the organisation's role.

My goal was to reach theoretical saturation of the explanatory patterns that were emerging across cases. The main advantage of my in-depth approach was the integration the qualitative analysis of the data sources with the mapping of inter-organisational relationships. This allowed for a two-way interaction during the theory-building process whereby I looked for relationships among emerging constructs and compared them against the SNA. For instance, while I was developing the coding of 'obstacles to coordination', I was also making notes based on the analysis of the structure of inter-organisational relationships. This was a critical step in intertwining the SNA with emerging constructs as it avoided 'context stripping'. Furthermore, it meant that the SNA and an inquiry into theoretical explanations of mechanisms could be developed hand-in-hand (Emirbayer & Jeff, 1994).

In summary, I have shown here how I developed an in-depth approach through the combination of the SNA (to map inter-organisational relationships) and qualitative analysis (to explore the theoretical mechanisms of coordination). Although unconventional, this approach was most suitable for addressing my research questions.

3.5. Reflexive Assessment of the Quality of the Methodology

In this last section of the chapter, I will carry out a reflexive assessment of the quality of the methodology I used in this study on the coordination of dynamic inter-organisational relationships. My assessment focuses on the criteria of external and internal validity and reliability. I followed ethical guidelines for conducting research.

3.5.1. Ethical Considerations

I followed the LSE Research Ethics Policy throughout this research study, which is in alignment with the broader framework of the ESRC[57]. I based my conduct on the LSE Research Ethics Checklist (**Appendix 1.10**).

Any ethical issues were discussed with my supervisor. Confidentiality of data was important because of the use of sensitive documents, such as minutes of meetings and progress reports. These documents often contained confidential information, such as details of contractual arrangements made among the parties. Drawings that I

[57] The framework by The Economic and Social Research Council is available from http://www.esrc.ac.uk/about-esrc/information/research-ethics.aspx.

accessed in this research cannot be disclosed here because, for instance, details such as floor layouts could be misused by third parties. I also encountered several accounts that, if leaked, could impact negatively on the reputations of the organisations involved. This concern was addressed by concealing the identities of the key organisations (and using fictitious names for the professionals involved in the projects). I named the organisations after their function in the project –client, main contractor and architect – which also served the purpose of reliability by conferring meaning to the reporting. There was also some documentation that contained confidential corporate elements, such as the main contractors' insurance numbers.

I followed the benchmarks for good research practice to ensure the confidentiality of the participants at every stage of this study. All interviewees at the exploratory stage gave their consent before taking part in the research. Whenever I recorded interviews, this too was done with their consent. When I approached organisations about participating in this research, my supervisor emailed the contact person to confirm the research aims of the study, and that I was indeed a PhD student with the Department of Management (DoM), at the London School of Economics and Political Science.

3.5.2. Validity, Reliability, Confidence and Relevance

The criteria for validity (internal and external) and reliability are benchmark quality indicators used in inductive research aimed at theory building (Bauer & Gaskell, 2000; Eisenhardt, 1989; Miles & Huberman, 1984).

Internal validity indicates the true co-variation between the variables under investigation, proving that a cause-and-effect relationship exists once alternative explanations have been addressed (Bauer & Gaskell, 2000; Miles & Huberman, 1984). I pursued internal validity through a permanent interaction (or 'recursive cycling') between the original research data and the analysis (Eisenhardt & Graebner, 2007, p. 25). Eisenhardt (1989, p. 544) asserts that 'an essential feature of theory-building is the comparison of the emergent concepts, theory, or hypotheses with the extant literature'. I used the extensiveness of the data to seek saturation of causal paths, which is when the analysis reaches a stage where the researcher arrives at the same explanation after multiple analyses (Glaser & Strauss, 1967). The

emergence of paths was identified through the triangulation of multiple sources (Jick, 1979) and summary tables synthesising the findings (Miles & Huberman, 1984).

External validity complements internal validity insofar as it refers to the generalisability of the findings to other research settings (Eisenhardt, 1989; Miles & Huberman, 1984). In my study, this means the validity of the findings on the coordination of inter-organisational relationships beyond the seven cases (and indeed beyond social housing and the building industry). In some traditions of case-study research, external validity is linked to replication logic (Eisenhardt, 1989; Yin, 1981). I sought external validity by reporting thoroughly all the procedures I followed. This study focuses on a particular 'niche' of the industry: social housing. A full account of the research context is given alongside the case selection criteria.

Reliability is the coherence and transparency of the analytical procedures (e.g. coding procedures) (Eisenhardt, 1989). Reporting the coding criteria helps to demonstrate reliability. I present a systematic report of the analytical procedures followed – in the main text and in the appendices. Consider the extraction of social network data from the minutes of meetings. In **Appendix 1.9**, I reproduce every step and procedure I used to extract the data, from coding the minutes to drawing the actual configuration of inter-organisational relationships. Furthermore, I also report on the study of inter-rater reliability of the coding process (**Appendix 1.8**); this was important to compensate for the lack of benchmark.

I aimed to make available all information about the entire research process and the analytical procedures followed. Reliability also relates to confidence in the research process. Confidence can be used to assess quality in qualitative research (Bauer & Gaskell, 2000). I have aimed to present a detailed report on my analytical procedures and data treatment so that one can 'reconstruct' my research journey. This should also assist others to assess the relevance of my study. Relevance in qualitative research is the extent to which the insights generated are unexpected in the light of current wisdom (Bauer & Gaskell, 2000).

Altogether, quality assessment criteria help to gauge the relevance of a piece of research. Moreover, in this case they lay out the terms for my research journey – an inductive enquiry into the coordination of dynamic inter-organisational relationships – that will be presented in the remainder of this thesis.

Chapter IV: Consequences of Coordination

Overview

In this first chapter of findings, I develop a cross-case analysis of the consequences of coordinating inter-organisational relationships, which shows stark differences across the seven cases of social housing projects.

I start by exploring an empirically derived model that led me to develop a multidimensional indicator of these consequences. Based on the content analysis of over 3,600 pages of minutes and project reports, I find that there are four dimensions that should be included in the indicator: ‘on time and on budget’, building certification, environmental sustainability and faults in the building. My findings show great cross-case variance regarding these consequences.

These cross-case differences provide further impetus for an inductive study of the theoretical mechanisms that underlie the coordination of inter-organisational relationships.

4. Drawings, Bricks and Consequences of Coordination

Following an inductive research design (Eisenhardt, 1989), I start by assessing the 'consequences' of the phenomenon under study: the coordination of inter-organisational relationships. In other words, and to borrow Thompson's words (1967), I ask whether the 'organisations achieved the most effective and harmonious results' as a consequence of the coordination of inter-organisational relationships.

During the course of my research, I came to appreciate the importance of developing an indicator that allowed for a cross-case comparison of the consequences of coordination. Furthermore, I learnt from the data analysis and from talking to practitioners that such an assessment would require sensitivity to the building industry and the inclusion of various dimensions. The result was a two-stage analysis in which I developed (1) an empirically derived model followed by (2) a multidimensional indicator of the consequences of the coordination of inter-organisational relationships. Surprisingly, given the similarity of the projects due to industry standards, my findings show stark differences in consequences across the seven social housing projects.

4.1. Deriving an Indicator of the Consequences of Coordination

I felt the need to derive an indicator of the consequences of coordination before I could address my research questions: *How are dynamic inter-organisational relationships coordinated?* and *Why do coordination problems occur in dynamic inter-organisational relationships?* Drawing on the richness and extensiveness of my data, I developed a multidimensional indicator that reflects the multifaceted nature of the construct of consequences of coordination.

Developing an indicator was necessary for several reasons. First, inductive reasoning requires an assessment of the consequences of the phenomenon under study followed by an inductive enquiry into the theoretical mechanisms that lead to such consequences (Glaser & Strauss, 1967). Second, assessing the consequences of coordination requires the researcher to be sensitive to the empirical context. As early as the exploratory stage of my research, interviewees warned how the specificities of the building industry shape the consequences of the coordination of dynamic inter-

organisational relationships. One interviewee (EI#10; CEO, main contractor) asserted that 'the building industry differs from what would seem to be comparable industries, such as the manufacturing industry and car makers'. Car makers – such as Jaguar, to use the example given by the interviewee – and builders assemble various components to make a product that has been designed in advance. While cars can be reproduced exactly (or, where there are variations, they are pre-defined), each building is unique, depending on the combination of materials and techniques used. This observation is *true* even when replicating building projects (e.g. the construction of design-standard schools across the country). Finally, I needed to develop the indicator of the consequences of coordination in order to overcome the absence of alternatives in prior research. A similar approach is followed by researchers interested in the effectiveness of inter-organisational networks (Davis & Eisenhardt, 2011; Provan & Milward, 1995).

I therefore turned to my data to develop an indicator of the consequences of coordination. I conducted a qualitative analysis of meeting minutes and project reports in order to produce a model based on 'the process of linking abstract concepts to empirical indicants' (Zeller & Carmines, 1980, p. 2).

4.1.1. Abstract Concept: An empirically-derived model

The abstract concept refers to the idea (i.e. the construct) that underlies the definition of the consequences of the coordination of inter-organisational relationships. I define the consequences of coordination as outcomes –positive or negative – that are linked to the (mis)alignment of resources and actions among interdependent organisations. I mapped this concept based on the content analysis.

I started by exploring the abstract concept based on the theoretical framework and the accounts given by interviewees from the industry. Similarly to prior research (Grandori, 1997b; Kogut & Zander, 1996; van de Ven & Gordon, 1984), I too found that the industry context matters, particularly in a large industry, and the project typologies vary widely. I have gathered this insight over the last three years while conducting my field work.

I learnt more about the specificities of the building industry as I focused on analysing my data from the seven social housing projects. I deployed 'open coding' techniques. These were most suitable for my analysis because, in them, the 'data are

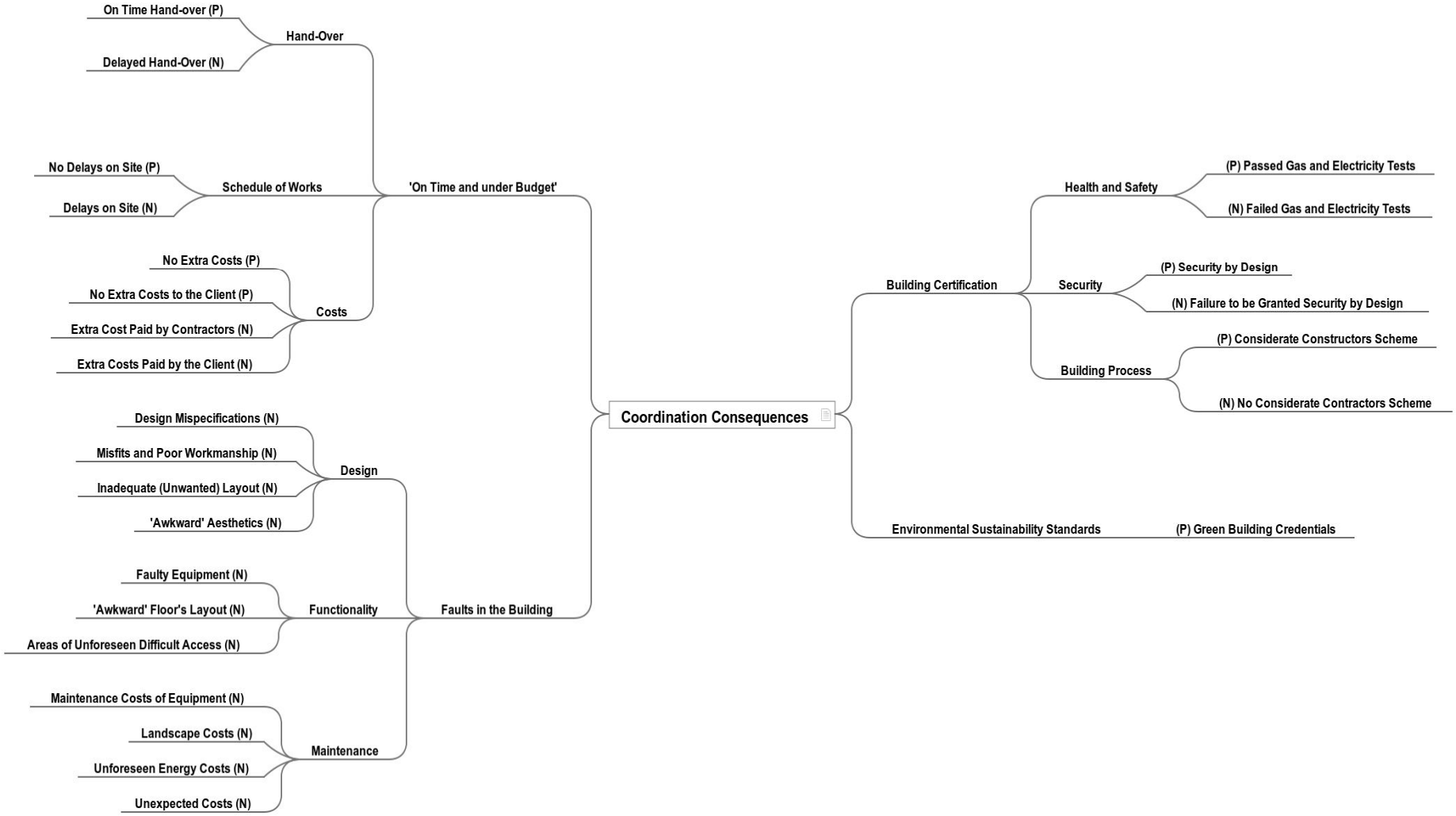
broken down into discrete parts' (Strauss & Corbin, 1990, p. 102), which allowed me to uncover discrete aspects of the consequences of coordination. I coded minutes of meetings and projects reports into broad categories that related to my definition of the consequences of coordination. I specifically focused on the board papers, project reports and minutes because these documents contained detailed information about the consequences. Board papers, which are documents that assess financial viability and set goals for a project, provided relevant information, such as targets for environmental sustainability standards and the delivery of the projects. For instance, the board paper for the Oakley Road project stated that 'the scheme will achieve an Eco-Homes rating of Very Good, as required on all 2006-08 schemes' (BP01 – Case#6). The minutes of meetings provided fine-grained information about the consequences of coordination throughout the design and build life-cycle. There were several instances of positive consequences, such as 'progress ahead of schedule' and cost savings, as well as negative consequences associated with delays and miscommunication. I coded all instances of coordination consequences and compared the categories until saturation of categories was reached. This fostered validity and reliability; categories were exhaustive and mutually exclusive.

Figure 11 shows an empirically derived model of the consequences of coordination. This built on my content analysis of examples (i.e. first-order concepts), which I aggregated into sub-dimensions (i.e. second-order concepts). These were aggregated into four dimensions (i.e. third-order concepts): 'on time and on budget', faults in the building, building certification and environmental sustainability standards.

(1) **'On time and on budget'** captures one of the most enduring challenges in the building industry: over-budgeting and delayed handover to the client. The notion of 'on time and on budget' is also language that is commonly used in the building industry, referring to the organisations' ability to deliver building projects within the forecasted completion time and total expected building costs. In North Wingfield (Case#3), 'the revised programme to completion showed delays in the works … with potential delays to the completion date' (MM16-W16/19-Case#3). As this remark illustrates, delays may refer to both the schedule of works and the handover to the client; these represent two sub-dimensions of 'on time and on budget'.

.

Figure 11 Empirically Derived Model of the Consequences of Coordination



Note: 'Positive consequences' are identified by **(P)** and 'negative consequences' are noted by **(N)**.

Costs are another sub-dimension of ‘on time and on budget’. Because all seven of the projects were publicly funded, they underwent rigid programmes to control any extra costs paid by the client. The importance of minimising extra costs to the client was asserted by the client’s representative from the Oakley Road project: ‘if there [were] a lot of exceptional costs to be incurred then the project would not progress and we would need to look at one of the sites identified within the two areas’ (BP01-Case#6). However, the data analysis shows that extra costs were in fact paid by the client and the main contractors. This happened in Dale Lane (Case#1), the client was liable for the extra costs of the topographical and land survey, following the quantity surveyors’ confirmation that these were not included in their fee.

Accordingly, the dimension of ‘on time and on budget’ resonates with elements of effectiveness, as conceptualised in research on inter-organisational relationships (Davis & Eisenhardt, 2011; Human & Provan, 1997; Ozcan & Eisenhardt, 2009; Uzzi, 1997). Effectiveness is viewed as the delivery of products on time and on budget (Human & Provan, 1997; Uzzi, 1997). In contrast, extra costs and delays suggest a lack of effectiveness (Stinchcombe, 1985b; van de Ven & Gordon, 1984).

(2) **Building certification** covers legal requirements spanning from the early stages of obtaining a planning permit to the handover stage. Specifically, building certification is found to integrate the sub-categories of health and safety, security and the building process (**Figure 11**).

Health and safety and security certifications related to the mechanical and electrical (M&E) services of the building, such as the testing of the gas infrastructure and electricity installations. A key certification regarding health and safety is the Security by Design, which social housing developers are required to apply for. In Dale Lane, the client’s manager clearly set the criterion that ‘Secured by Design certification must be achieved’ (MM01-W1/12-Case#1). This was important so as to ensure that the local council issued the completion certificates.

Certification of the building process also included the Considerate Contractors Scheme, as required by the funding agencies. This certification requires that the main contractors are registered with the scheme, and aims to ensure that contractors and sub-contractors purchase sustainably sourced products (e.g. timber) through regular audits of the site. The client and the main contractors were keen on improving their score in this aspect because it would have an impact on other certifications, such as the CfSH. At the Blyth Court project, the client’s project manager suggested that ‘a

Considerate Constructors score of 32 next time (ie an increase of 0.5 points) would mean additional Code For Sustainable Homes points. [Main contractor's project manager] to review to see if any of the assessors recommendations can be easily incorporated' (MM06-W6/12-Case#5). This shows how coordination among organisations is needed in order to obtain building certification. I argue, therefore, that building certification is an appropriate dimension of the consequences of the coordination of inter-organisational relationships.

(3) **Environmental sustainability standards** capture the ongoing industry endeavours to deliver 'greener buildings' (**Figure 11**). These are demanded by clients, but also by the planning authorities due to the UK Government's targets for the environmental sustainability of newly built projects[58].

The findings suggest that the client and their agents can play an active role in encouraging the architects and the main contractors to adopt environmentally sustainable options. In Dale Lane (Case#1), the client's agent 'proposed that [the] development is required to achieve Level 3 status on the Code for Sustainable Homes assessment, thus, an element of renewable sources will be required to satisfy this requirement' (MM09-W9/12-Case#1). The introduction of renewable sources required the organisations to coordinate so that these sources could be introduced without negative consequences to the project, such as delays. The pursuit of Level 4 of the CfSH in North Wingfield (Case#3) led them to install a biomass system that caused several delays to the projects (due to misspecifications).

Environmental sustainability standards were enforced in the social housing projects as the funding agencies set environmental sustainability targets as a condition of funding. The failure to attain such standards seems to have stemmed from a lack of coordination among the organisations involved.

(4) **Faults in the building** is the last sub-dimension of the consequences of the coordination of dynamic inter-organisational relationships (**Figure 11**). In all seven cases, the buildings were inspected for faults and poor workmanship a couple of weeks ahead of the handover of the project to the client. Drawing on content analysis, I found that the dimension of faults in the building related to the following: design, functionality and maintenance. Design-related faults included misspecifications in the drawings and unwanted aspects of the floor layout. These

[58] *Low Carbon Construction Innovation & Growth Team*. H M Government, London (2010).

issues also sometimes resulted in poor aesthetics. Functionality entailed faulty equipment (e.g. faulty light switches) and ‘awkward’ spaces in the floors (originating in design misspecifications). Maintenance included the costs of maintaining equipment and landscaped areas.

A further analysis of this dimension unveiled a linkage to the dimension ‘on time and on budget’. The former stresses the short-term perspective while the latter the long-term. Building costs (as paid by the client) are a short-term issue, while faults in the building – in terms of maintenance – represent high costs in the long term (to be paid by the client). These aspects relate to an industry-wide debate about the balance between short- and long-term costs in building projects (Smyth, 2010).

In sum, I built on the content analysis to map the abstract concept of the consequences of the coordination of inter-organisational relationships. The result was an empirically derived model including four dimensions: ‘on time and on budget’, building certifications, environmental sustainability standards and faults in the building. In the following section, I develop a set of empirical indicants.

4.1.2. Empirical Indicants: A multidimensional indicator

I built on the data coding to approximate the abstract concept of the consequences of the coordination of inter-organisational relationships to a set of empirical indicants. Altogether, these led me to create a multidimensional indicator of the consequences of coordination.

Empirical indicants approximate and locate the abstract concept empirically and should be exact and bounded to a theoretical framework (Zeller & Carmines, 1980, p. 3). The transition process between the abstract concept and the empirical indicants of the consequences of coordination was grounded in the content analysis of over 3,600 pages of project reports and minutes of meetings. I started by focusing on the first-order coding to develop an approximation of the information gathered from the minutes that could be developed into empirical indicants for the comparison of cases. Next, I calibrated the empirical indicants to ensure they allowed comparability but were also consistent with the sub-dimensions (i.e. second-order concepts) and dimensions (i.e. third-order concepts) of the abstract concept of the consequences of the coordination of inter-organisational relationships.

To illustrate this procedure, I now describe the transition process for ‘on time and on budget’. This dimension proved to entail three sub-dimensions: handover, schedule of works and costs. Furthermore, I matched the first-order concepts with eight empirical indicants: on time handover (yes; no), delayed handover (number of weeks), no delays on site (yes; no), delays on site (number of days), no extra costs (yes; no), no extra costs for the client (yes; no), extra costs paid by contractors (yes; no) and extra costs paid by the client (£). These are shown in **Figure 11,** where the information in parentheses is the unit of measure for each empirical indicant.

Measurability was critical for my cross-case analysis of the consequences of coordination. I also made a distinction between the positive and negative consequences (**Figure 11**) that was consistent with the theoretical framework developed in **Chapter II** and the definition of the consequences of coordination.

In sum, I drew on my content analysis of minutes and project reports to develop a two-stage analysis that entailed an empirically derived model followed by a multidimensional indicator of the consequences of the coordination of inter-organisational relationships. Facing the absence of such an indicator in prior literature, my indicator is sensitive to the industry context and includes the various facets of the consequences of coordination. This allowed me to carry out a systematic cross-case comparison of these consequences, as I show below.

4.2. Similarity of Drawings Yet Contrasting Results On Site

Now, I built on the previous analysis to carry out a cross-case analysis of the consequences of the coordination of inter-organisational relationships. Surprisingly, my findings show that the consequences differ greatly across cases.

The story of each of the seven social housing projects was very similar at the start of the design and build life-cycle. Once the decision had been taken to go ahead with a new social housing project, the client started interacting with other organisations. The next step was to appoint an agent and a main contractor, which would eventually lead to an arrangement among various organisations with the purpose of attaining a common goal: tackling the social housing shortage in the community. In other words, this was an attempt by ‘a particular group of human beings to do something’ (Penrose, 1959). The consequences of coordination were different, though as I will show in my cross-case analysis.

First, and for clarity's sake when conveying my findings, I use an overall score entailing three levels: high, medium and low (**Table 10**). A score of 'high' denotes cases where the consequences of coordination led to fully achieving the purpose for the building project, for instance, a project that was delivered on time and at no extra cost to the client. In contrast, a score of 'low' refers to cases where the consequences of coordination were only marginally achieved. This includes over-budget costs being transferred to the client and delays in the handover of the project. (The methodological procedures are thoroughly described in **Appendix 2.1**.)

My analysis resulted in only three projects registering a high score: Rowlett Road (Case#4), Oakley Road (Case#6) and Washbrook Road (Case#7). In these projects, the inter-organisational relationships successfully attained 'on time and on budget' targets, building certifications and environmental sustainability standards, while only minor faults inin the building were registered. The Fulmar Road (Case#2) and Blyth Court (Case#5) projects were found to merit a 'medium'. Dale Lane (Case#1) and North Wingfield (Case#3) received 'low' (**Table 10**). This was due to costs coming in over budget, delayed handovers and the failure to achieve building certifications, such as the SbD certification in the case of the Dale Lane (Case#1).

As important aspect of the reliability[59] of the indicator of the consequences of coordination is that it is not influenced by the size of the project. Consider a comparison of the building costs of two similar projects: Dale Lane (Case#1) and Washbrook Road (Case#7). The findings suggest very dissimilar figures for the consequences of coordination, as the Dale Lane project registers a 'low' score and the Washbrook Road (Case#7) a 'high' score. Furthermore, the overall score is not influenced by the weather conditions that prevailed during the work on each site. Prior research in construction management posits that progress on site is dependent on weather conditions, particularly if ground works and structure are being built during the winter. The impact of weather conditions on the consequences of coordination is little. This claim is supported by the comparison between Dale Lane (Case#1) and Oakley Road (Case#6). In the former project, ground works and structure were built mostly during the summer (works on site started in May 2008). In the latter they were carried out during the winter (starting in November 2008).

[59] In **Appendix 2.1**, I report a series of methodological steps taken with the aim of ensuring the reliability and validity of my indicator of the consequences of coordination.

Yet, the organisations working on the Dale Lane (Case#1) appear to have underperformed compared to those involved in Oakley Road (Case#6).

Altogether, I argue that the overall score of consequences of the coordination is robust and allows cross-case comparability. Below, I report the findings of the fine-grained analysis across the four dimensions of coordination consequences: (1) 'on time and on budget'; (2) building certifications; (3) environmental sustainability standards; and (4) faults in the building (**Table 10**).

(1) **'On time and on budget'** is one of the dimension for which I observe the most cross-case differences. Washbrook Road (Case#7) is the only project completed 'on time and on budget'. Although in other housing projects (cases #1; #4; #5 and #7), organisations delivered the projects without additional costs, the handovers were delayed. These clients – publicly funded housing associations – are incentivised to control the building costs rigorously. This was asserted by a senior manager at one of the UK's major contractors 'the spend [building costs] is very important for local authorities so they have to measure it as part of their criteria' (EI#11; Head of Strategy and Sustainable Development). Alongside the total building costs, the organisations seek 'value for money'. In Rowlett Road (Case#4), '[the client's agent] regarded that a tender not exceeding £2,780,000 would represent value for money in the current tendering market…' (BP01-Case#4). Value for money and controlled building costs are targets set among all parties to a project, as my analysis of project reports and financial recommendations made to the client by a quantity surveyors' practice showed.

As far as on-time project delivery is concerned, several projects reported a delay of two to three weeks. The Dale Lane (Case#1) had a delay of three weeks, significant considering the total forecasted completion time of 14 months. In contrast, the North Wingfield (Case#3) saw a delay of only two weeks against a 24-month expected completion time. The minutes and project reports show that delays were mostly due to misalignment of actions among organisations. To illustrate, in Fulmar Road (Case#2), delays occurred 'due to the additional gas monitoring works. [Main contractor] to issue costs for overrun to [client's agent] for review (MM12-W12-Case#2).

Table 10 Cross-Case Analysis of Coordination Consequences

Case study	'On Time and on Budget' (1)		Building Certifications (2)	Environmental Sustainability Standard (3)	Faults in the Building (4)	Illustrative Quotations	Overall*
	Over Time	Over Budget					
Dale Lane Road (Case#1)	3 Weeks	On budget	Building Control, Considerate Contractor, Gas & Electric Test Certificates **Failure to achieve SbD certification**	Level 3 of the CfSH	Grass areas, and 'spotting' on the walls and ceilings	*Unfortunately with this site the developer failed to apply for the Secured by Design Award until after the building was almost complete, the roof was on at the time of my first visit request* (PI01-Case#1)	**Low**
Fulmar Road (Case#2)	3 Weeks	**Over budget** (£17,000)	SbD, Building Control, Energy Performance Certs, Considerate Contractor, Gas & Electric Test Certificates	Level 3 of the CfSH	Access to roof and windows; gutter maintenance; cleaning of windows; maintenance and assistance to gas boiler; rainwater harvesting; access to manhole. There were also design misspecifications and poor compliance with planning permission	*Extension of* [completion] *time associated with the delay due to the additional gas monitoring works.* [Main contractor] *to issue costs for overrun to* [clients' agent] *for review* (MM10-W10-Case#2) *Previously, 13 tanks had been recommended. This was an error as a result of incorrect Engineer calculations* (MM13-W13-Case#2)	**Medium**
North Wingfield (Case#3)	2 weeks	**Over budget** (£155,000)	Building Control, SbD, Considerate Contractor, Gas & Electric test Certificates	Level 4 of the CfSH	Energy supply costs and maintenance; toilet's flush rate; heating costs; operability of doors; right of way; costs of the biomass system for the tenants	[Main contractor] *issued project programme indicating current progress and a completion date of 21st September 2009* (MM08-W08-Case#3)	**Low**
Rowlett Road (Case#4)	On time	On budget	Building Control, SbD, Gas & Electric Test Certificates	BRE Eco-Homes rating 'Very Good'	Roof durability (and maintenance); maintenance of amenity areas; landscaped areas; staff members' access to the communal areas of the flats	[Client's agent] *have confirmed that a tender not exceeding £2,780,000 will represent value for money in the current tendering market…* (BP01-Case#4)	**High**

(Table continues on next page)

Blyth Court (Case#5)	2 weeks	On budget	SbD Building Control, Considerate Contractor, Gas & Electric Certificates	Ecohomes Pass	Maintenance and water supply; shower bases and pumped waste; maintenance of the boiler on the second floor; flush cistern; glazing of external windows; water-saving taps; injuries caused by the operation of the doors; safety of the site; external lighting; fire hoses; manholes	*It was also noted that after the last site meeting the site inspection showed that the proposed light fitting in the shared ownership kitchens did not meet the requirements of the Code* [CfSH - Code of Sustainability Homes] (MM12-W12-Case#5)	**Medium**
Oakley Road (Case#6)	On time	**Over budget** (£13,000)	SbD, Building Control, Considerate Contractor, Gas & Electric Certificates	Ecohomes Pass	No particular concerns reported	*The project is currently 10 days behind programme*. [Yet, the project was completed on time because the main contractor intensified collaboration with several suppliers and sub-contractors to integrate work shifts on site] (MM06-W06-Case#6)	**High**
Washbrook Road (Case#7)	On time	On budget	Gas & Electric, EPCs, Considerate Contractor, Building Control, SbD Certificates	Level 3 of the CfSH	Casement and windows; walls in the bin storage area; floor areas (e.g. vinyl and carpets)	*The project was currently 3 weeks ahead of programme taking into account good internal progress and the roofing and external walling not being on the critical path.* (MM06-W06-Case#7)	**High**

* I report the methodological details in **Appendix 2.1.**

In Oakley Road (Case#6), the contractor's reports register a time recovery of ten days (CR02-Case#6) after the main contractor intensified collaboration with several suppliers and sub-contractors to integrate work shifts on site. This example shows the role of coordination among organisations so as to attain a given purpose – in this case on-time project delivery. Of course, geological and meteorological causes are widely reported reasons for delays to building projects (Smyth & Pryke, 2008). However, these were found to play only a sporadic role in the delays of the seven social housing projects. This provides further evidence of the importance of the coordination of inter-organisational relationships in explaining the consequences (e.g. delays and extra costs) as opposed to technical or natural (e.g. weather or geological conditions) explanations. The latter factors are dominant in the narratives from the industry and academic literature, however (Smyth & Pryke, 2008).

(2) **Building certifications** were achieved across the seven cases. However, in Dale Lane (Case#1) the main contractor failed to coordinate with other organisations so that the SbD[60] was not granted to the building. This was despite the warning by the client's agent that 'Secured by Design certification must be achieved' (MN02-W2-Case#1). Such requirements of building certifications are enforced by planning authorities and clients of the projects. Some certifications, such as gas and electricity tests, are legally required before tenants can move in. Other certifications – for instance, SbD – are typically required by funding agencies.

As shown in Dale Lane (Case#1), failure to achieve the required building certification can stem from poor coordination among organisations. This was further supported in an email exchange with one of the police officers involved in Dale Lane (Case#1). He asserted that 'unfortunately with this site the [main contractor] failed to apply for the Secured by Design Award until after the building was almost complete, the roof was on at the time of my first visit request' (EE01-Case#1). This suggests that coordination of inter-organisational relationships is important for achieving building certifications because it requires integration across domains of organisational expertise (Eccles, 1981). Consider the example of certifications on gas and electrical installations – to use an indicator for the dimension of 'building certification' that is reported across all seven case studies. This certification engages

[60] SbD focuses on crime prevention for homes and commercial premises and promotes the use of security standards for a wide range of applications and products. See http://www.securedbydesign.com/ (retrieved on 10/12/2011).

the gas and electrical sub-contractor (which might even be contracted from separate contractors) and also the engineers and the main contractor. It is equally important that the gas and electrical sub-contractors coordinate their workloads with the progress made on site by other contractors (e.g. plasterers[61]).

(3) **Environmental sustainability standards** were sought across all seven social housing projects (**Appendix 2.1)**. In Fulmar Road (Case#2), for example, the client communicated to all organisations that the 'CfSH Assessment[62] will form the target for the construction phase'. Furthermore, the client required that 'any divergences from the current CfSH Assessment will be subject to agreement by both parties [the main contractor and the client] prior to implementation…' (MM05-W5-Case#2).

In all cases, the organisations met the targets for environmental sustainability set at Level 3 of the CfSH or equivalent (i.e., BRE Eco-Homes 'Pass') (**Table 10**). The North Wingfield (Case#3) met Level 4 of the CfSH, following the target set by the client at the start of the project. Environmental sustainability standards are expected in the current context. This is conveyed in the development of policies and assessment tools for the sustainability of the built environment.

Environmental sustainability standards often demand new technologies and building techniques that require adjustments to the coordination practices among organisations. In Fulmar Road (Case#2), the installation of a new heating system was essential to achieving level 3 of the CfSH. However, this new technology also required additional coordination among the organisations working on the project. The data show that coordination problems were involved in the installation of this heating system. The main contractor ordered 13 tanks instead of 18; however, the number of the tanks ordered 'was an error as a result of incorrect Engineer calculations' (MM13-W13-Case#2). Incorrect orders of supplies can lead to unintended consequences, such as delays and additional costs to organisations.

(4) **Faults in the building** can affect aesthetics, as well as functionality and maintenance costs. For the Oakley Road (Case#6), no faults in the building were reported. However, several were recorded in Fulmar Road (Case#2) and Blyth Court (Case#5) projects. At Fulmar Road (Case#2), the client's project manager reported

[61] Plaster is a material similar to mortar or cement that is made from dry powder mixed with water to form a paste. It is used in the building industry for coating walls and ceilings.
[62] The CSH is the national standard for the sustainable design and construction of new homes. The code aims to reduce our carbon emissions and create homes that are more sustainable. See http://www.communities.gov.uk/planningandbuilding/sustainability/codesustainablehomes/ (retrieved on 10/12/2011).

specific concerns about costs associated with the maintenance of the building. These were related to difficult (and even hazardous) access for cleaning personnel to the roof and windows in one section of the building that were expected to increase the maintenance costs for the client in the long term. Additional maintenance costs reduce the 'value for money' for the client and tenants alike. For the client, lower building costs are often offset by higher maintenance costs. For the tenants, the possibility of affordable housing is reduced (since the client has to reflect these additional maintenance costs in the rent charged). As an illustration, at Dale Lane (Case#1), the realisation of additional maintenance costs for the external communal landscaped areas and internal communal areas led the client's manager to posit that 'a service charge [would] be required' from the tenants (MM11-W11/12-Case#1). Nevertheless, the provision of affordable housing is an imperative for social housing providers because of the low incomes of the tenants (Hills, 2007).

Aesthetic-type faults in buildings often result from limited coordination among organisations. In Blyth Court (Case#5), reduced space in the kitchen to access the boiler, and problems with the flush cistern, stemmed from miscommunications among the architect, the main contractor and specialist suppliers. In the end, the main contractor and the client agreed on remedial work.

Overall, the seven case studies vary greatly across the dimensions of 'on budget and on time', building certification, environmental sustainability standards and faults in the building. This shows how different these projects were on site in terms of the consequences of coordination, contrasting with the similarity of the initial drawings.

In sum, my findings show stark cross-case differences regarding the consequences of the coordination. My analysis benefited from an empirically derived model that captured the industry context and the multiple dimensions of the consequences of the coordination. This is substantiated in a multidimensional indicator. My findings show that, despite the similarity of the drawings, the consequences of coordination varied greatly across cases. Since the projects were similar in terms of industry standards, such differences shift the focus of the explanation away from technical aspects and on to more fundamental mechanisms of interaction among organisations. This provides further impetus to study the theoretical mechanisms that underlie the coordination of inter-organisational relationships.

Chapter V: Coordination Mechanisms

Overview

This chapter will address the first research question of this study: *How are dynamic inter-organisational relationships coordinated?* My findings show that the use of contractual arrangements and the hiring of monitoring organisations are not (directly) related to the consequences of coordination.

Through an in-depth approach using the SNA to map the inter-organisational relationships on a monthly basis, and qualitative analysis of project documentation, I uncovered that mechanisms intended to aid coordination and the structure of inter-organisational relationships are interwoven The coordination of dynamic inter-organisational relationships unfolds through two mechanisms: organising and relating. Organising occurs as the use of contracting fosters hierarchy, while relating stems from monitoring organisations, which foster density in inter-organisational relationships.

Furthermore, the coordination of dynamic inter-organisational relationships is required to help those involved juggle the coordination mechanisms of organising and relating over time. This juggling process entails three distinctive stages: mobilisation, shape-up and sustainability. I found that this sequence of coordination mechanisms explained the stark differences in the consequences of coordination (as observed in the previous chapter) across the seven cases studied.

5. Coordination Mechanisms of Organising and Relating

Here, I explore the theoretical mechanism of the coordination of inter-organisational relationships. I start by studying the various case organisations in terms of their contributions to the projects and their architecture of dependence. My analysis denotes the importance of the coordination of inter-organisational relationships. However, it also exposes the limitations of the old wisdom regarding mechanisms of coordination. I found no (direct) relationship between (1) the use of contracts and (2) the hiring of monitoring organisations, on the one hand, and the consequences of coordination on the other.

The turning point in my enquiry emerged from a longitudinal analysis of the inter-organisational relationships; variations in the use of contracts and the hiring of monitoring organisations uncovered an unexpected pattern. Hiring monitoring organisations leads to density, while contracts foster a hierarchy of inter-organisational relationships. The former pattern entails the mechanism of *relating* and the latter the mechanism of *organising*, two mechanisms for coordinating dynamic inter-organisational relationships; furthermore, the sequence of these mechanisms proved to explain the cross-case differences in coordination.

5.1. Organisations and Coordination

Organisations from different backgrounds come together once the client has initiated the process of delivering a social housing development. In this section, I explore the heterogeneity of organisations involved in each of the seven projects. Following prior research on the administrative mechanisms of coordination (Ring & van de Ven, 1994), I examine the relationships between contracts and monitoring organisations, and the consequences of coordination. I also explore the link between the structural properties of the inter-organisational relationships and coordination, as suggested by the social network approach (Coleman, 1994). Both approaches prove limited in explaining the cross-case differences in the consequences of coordination.

At the start of each project, organisations and resources were yet to be coordinated towards their purpose: to design and build a new social housing development. A preliminary analysis suggests that early inter-organisational relationships in the projects underwent two routes. The first route occurred when a housing association (i.e. the client), sought to start a relationship with other organisations in order to

design and build a new social housing development (Cases #1, 2, 3, 5 and 7). This included interaction with architects, local councils and potential main contractors. In the second route, developers – i.e. organisations with building and design capabilities – approached local housing associations (Cases #4 and 6). Developers sought to make contact with potential clients regarding the purchase of land with planning approval for social housing developments. The second route is an illustration of how organisations initiate coordination because of strategic interests, that is, the prospect of future business (Gulati & Gargiulo, 1999; van de Ven, 1976). Both clients and developers exchanged information and regarded each other's resources as mutually strategic – through complementarity – for their own activities.

Across the seven cases, the development of the new social housing project was led by a local housing association regardless of the route followed to start the project. The process started once the local housing association (or local council) had identified a shortage of social housing in the local area. For instance, in the Dale Lane project (Case#1), the shortage of social housing was reported in a board paper by the client: 'According to [the local council]'s Housing Needs Analysis, there is a shortfall of 641 affordable units in this area' (BP01- Case#1). Accordingly, the project was aimed at tackling the shortage of social housing in the local area. However, this instance also shows how the response to a local need for social housing is incremental. Given the scarcity of financial resources available to local housing associations, the Dale Lane (Case#1) was to provide only 18 units (against the 641 required). Housing associations have to compete for funding from national-level programmes (e.g. the Affordable Housing Programme).

As is the case with any 'attempt to do something', the delivery of the social housing projects entailed inter-organisational relationships that were embedded in the social scene within the local community (e.g. the local council). The Rowlett Road (Case#4) was located in the surroundings of a town in the East Midlands. The site was an established residential area close to infant and junior schools and a large area of established public woodland. The building project became integrated in the local community through its central location in a place that was once the epicentre of the local community.

The social housing projects were strongly linked to the social scene of the local communities. Organisations from the local community were, therefore, involved in the inter-organisational relationships alongside organisations with unique expertise in

designing and building typically associated with the delivery of building projects. This type of integration of an inter-organisational collaboration within the social scene has been reported previous for a variety of inter-organisational collaborative arrangements, such as technology collaborations (Ariño & Torre, 1998; Doz, 1996) and inter-agency collaborations (van de Ven & Gordon, 1984). The social context is important as the design and build of a social housing project is a joint effort by various individual organisations providing contributions of expertise and equipment.

5.1.1. Organisations, Organisational Expertise and Interdependence

Individual organisations from a wide spectrum came together in a structure of complementary resources and organisational expertise, creating interdependence among them. The design and build life-cycle involved great heterogeneity of organisations based on the variety of organisational expertise (e.g. architects, main contractors, the local council, consulting firms and engineering firms.

The organisations working on the seven building projects operated across industries and throughout the country. Each organisation was an independent entity operating in the marketplace. In order to study the functions and expertise of every organisation involved, I examined project reports and minutes from meetings. The project reports are monthly documents issued by the main contractor, containing directories of the organisations working on the site at each point in time, as well as detailed descriptions of each organisation's role in each project. Once all of this information was compiled and checked against other relevant sources of data – e.g. via phone calls to the project manager – I generated a month-by-month list of organisations and their key expertise.

Organisational expertise, which often overlapped with the organisations' role, refers to the set of skills provided to the project by an organisation (Bechky, 2006; Gann, 1991). These skills represent intangible assets; however, organisations across domains of expertise also contribute tangible assets, such as heavy machinery and equipment. The final contribution by each organisation is therefore a combination of tangible and intangible assets (Pfeffer & Salancik, 1978; Smyth & Pryke, 2008). I searched for accounts of the roles played by the organisations in each project and developed categories of organisational expertise based on data coding. Information available from multiple sources of data provided a fine-grained account of the

different types of expertise required in each building project. This provided an advantage over simple standard industry classifications. My analysis shows six categories of organisational expertise: design, building, engineering, monitoring, planning and other (**Table 11**).

Design functions were carried out by organisations such as architects and interior designers. Architects played a key role, mostly in the early stages of the project, in drawing and redrawing the building designs to meet the client's specifications and the requirements for planning permits[63]. Solutions for the layout of the building (e.g. interior comfort and exterior aesthetics) were the main inputs to the building project provided by both architects and interior designers.

Building organisations, which represented one of the largest categories in terms of the number of organisations, contributed with specialised equipment and expertise. Although the building capabilities were mostly the responsibility of the main contractor, specialist building expertise would be brought in via several other organisations. This included carpenters, plumbers and electricians (**Table 11**). Sub-contractors providing building expertise would represent the majority of the organisations engaged in the project at some stages of the design and build life-cycle. For instance, the main contractor on the Oakley Road project reported that a total of sixteen sub-contractors were involved, providing services such as brickwork, glazed wall tiling and loft insulation (CR01-Case#6).

Engineering expertise included a variety of specialist services (**Table 11**). For instance, structural engineering firms would do the calculations regarding the stability of a building's structure (e.g. deciding whether pillars and floors should be made of concrete, steel or timber). These calculations would be passed on to the architect for the finalisation of the drawings (e.g. for allocating weight across the built area). M&E engineers were in charge of the design and installation of, for instance, communication (e.g. telephones) and heating systems in the building. This would include the location of water pipes, gas and electrical cables, to be matched with flat layouts as well as the legal requirements regarding health and safety (H&S). M&E engineers were also responsible for specifying the requirements for utilities (e.g. electricity and gas). M&E services require highly specialised expertise. Some

[63] Planning permits are laws and regulations regarding planning approvals, which are set at the UK Government's policy level and enforced at the local level by local councils.

engineering firms also contributed highly specialised equipment and machinery (e.g. sub-contractors for ground works).

Monitoring was carried out by organisations with management mandates, such as clients' agents, and by the clients themselves (**Table 11**). These organisations contributed primarily with skills and specialist expertise rather than physical resources. The monitoring role of quantity surveyors was ridiculed by one of the interviewees; for him, quantity surveyors were 'technical geeks that like taking things apart and putting them back together to analyse the cost' (EI#14; Chief Executive of Professional Body). The interviewee claimed that quantity surveyors became the guardians of the building costs, but they often had an atomised perspective that failed to take into account all aspects of the project and the necessity of coordination among organisations. Quantity surveyors were found to be monitoring the design and building process, acting as the clients' agents, in all seven building projects, with the aim of ensuring 'on time and on budget' completion.

Planning is a domain of expertise that is mostly restricted to the Building Control departments of local councils although occasionally other government departments might be involved as well. These organisations have a legally endorsed authority, for example to grant planning permissions (**Table 11**). Planning authorities demand building specifications (in terms of design and materials) based on legal frameworks, such as low inclination ramps for access by disabled people.

Other organisations involved in the projects included utilities companies and providers of community services (e.g. post offices). They were found to be fundamental to project completion. Utilities companies – national providers of gas, water and electricity (national grid) – were required to coordinate their actions with organisations directly engaged in the projects. Utilities were essential to the building process, as well as to the full functioning of the newly built social housing developments (**Table 11**).

Table 11 Organisations, Organisational Expertise and Interdependence

Organisations (Nodes $_{i; j}$)	**Expertise/Function**	**Expertise Domain** (Category)	**Interdependence** (Tie x_{ij})	
			Within Expertise Domain	Across Expertise Domain
Architect	Drawings used by the builder	**Design** (Drawing the building)	* The architect was required to coordinate with interior designers to finalise the drawings	* The architect was required to work closely with the local council and the main contractor.
Interior designer	Details concerning the refurbishments – e.g. floor layout			
Main contractor	Building (concrete and steel frames)	**Building** (Building in concrete and steel, as well as providing a large array of services and equipment)	* Main contractor worked closely with specialist contractors in order to manage the work progress on site. * The main contractor was required to sub-contract many services from other organisations (e.g. plumbing).	* Main contractors were often required to coordinate with local council regarding planning permissions. * As the key organisation on site, the main contractor was required to work closely with the client's consultants. * Main contractor worked closely with engineering firms.
Electrician	Electrical installation, e.g. lighting, alarms and CCTV systems			
Lift supplier	Fabrication and installation of mechanical platforms, e.g. 'standard' lifts and stairlifts			
Carpenter	Fabrication and fitting of joinery, e.g. doors and cupboards			
Plumber	Installation and testing of plumbing services, e.g. water and gas			
Structural engineer	Calculation of the stability of the building, e.g. whether pre-cast beams were required	**Engineering** (Specialist skills required to ensure structural stability and functionality of the building)	* The calculation by the structural engineers had to be reflected in the assessment of the ground conditions by the geological engineers. * M&E engineers worked closely with structural engineers regarding the technical specificities for the M&E services.	* Structural engineers were dependent on planning permissions for choosing technical solutions. * Architects and structural engineers had to work closely together. * Engineering firms often depended on utility companies (e.g. gas and water) regarding the technical specifications required to connect to the national grid.
M&E engineers	Design and supervision of the installation of mechanical and electrical services, e.g. water, gas and anti-fire systems			
Geological engineering and survey	Equipment and knowledge to survey ground conditions in terms of stability and conditions, e.g. water streams			

(Table continues on next page)

Client's agent	Building management working with other organisations on client's behalf	**Monitoring** (Skills to monitor the entire design and build life-cycle)	*Client's agent worked according to the client's requirements for the project. * Sustainability consultants had to work with the client in order to assess suitable strategies for environmental sustainability.	* Client's agent depended on the local council for planning permissions, as well as authorisations for carrying out work, e.g. on public ways. * Both client and its agents had to coordinate with the main contractor. * The client had to work closely with the architects and designers.
Sustainability consultant	Advisory and managerial skills regarding building's performance in terms of environmental sustainability standards			
Client	Supervision and informing other organisations about the design requirements for the project			
Quantity surveyor	Calculation of quantities of materials, workload (bill of quantities) and estimates of building costs (budget).			
Local council	Planning control and progress on site	**Planning** (Legally binding supervision and enforcement of planning-related requirements)	* The local council is in charge of issuing planning permission but must consult relevant organisations, e.g. the EA.	* Although planning organisations were legally endorsed, these organisations often depended on main contractors for working out technical solutions for the building. * Planning organisations depended on the post office to issue definitive postal addresses to the new buildings and tenants.
Environment Agency (EA)	Supervision and enforcement of relevant legal framework, e.g. advising on flood risk			
Highways Authority	Maintenance and legal bidding authority over public roads			
Utilities (e.g. gas and power grid)	Ownership and management of infrastructures of utilities that need to be connected	**Other** (Random aspects that were nonetheless required)	* Low interdependence	* Utility companies depend on the local council to issue licences and certificates, e.g. to locate public sewers.
Post Office	To issue new postal addresses to new social housing developments			

The backbone of a relationship between organisations is interdependence, where the actions of one organisation shape the possible actions of others (Pfeffer & Nowak, 1976; Ring & van de Ven, 1992). When approached to start work on the site, the main contractor on the North Wingfield project 'confirmed the situation as

regards the commencement of on site is dependent on receipt of service diversions and section approvals [from the engineering firm and the local council]' (MM03-W3/19-Case#3). Interdependence was pivotal across all seven building projects since individual organisations contributed specialist resources (i.e. expertise and equipment). Individual organisations were not self-sufficient but interdependent in that their actions were shaped by the actions and resources of other organisations. The importance of interdependence among organisations was further noted by an interviewee: 'you don't have the in-house understanding and you are reliant on expertise from elsewhere' (EI#4; Chief Executive of Professional Body).

My analysis of the architecture of interdependence among the organisations shows that this occurred both within domains of organisational expertise (e.g. between two organisations with building expertise) and across domains (e.g. between one organisation with design expertise and another with building expertise). In **Table 11,** I illustrate typical examples of interdependence among the organisations involved in the seven projects. The building organisations tended to experience interdependence within their domain of expertise (i.e. with other organisations with building expertise) more than the other expertise domains. Actions by building organisations were often shaped by sub-contractors (other organisations that were also contributing building expertise). For instance, in Fulmar Road (Case#2), the main contractor was 'in contact with sub-contractors concerning these [reference to tanks] as individual rather than communal tanks [were] the preferred route' (MM08-W8/18-Case#2). Tanks were installed to provide heating and water to the buildings. After assessing the ground conditions, the main contractor was asked (by the client and the architect) to opt for individual instead of communal tanks. Nevertheless, the main contractor depended on advice from the relevant sub-contractors.

However, it was not only organisations working on site that had interdependent relations with others within the same domain of expertise. In Oakley Road (Case#6), planning permission was asked by the client to the EA was rejected several times on the grounds of flood risk. This example also illustrates how the country's legal framework shapes interdependencies among organisations (BP01-Case#6).

All seven social housing projects inevitably became stories of inter-organisational relationships due to the task-related interdependence among the organisations, across domains of expertise. The architects depended on information from the clients regarding capacity (i.e. number of tenants) so that they could proceed with their

drawings. Often, the clients had specific requirements, for example, regarding accessibility to the flats for disabled people (Case#5). Architects were also dependent on other organisations, such as structural engineers so that the building's layout would allow for a stable structure. This was not particular to this set of case studies. One interviewee argued that 'architects in the UK don't have formal technical knowledge like they do in the rest of the Europe'. One important insight in this quotation is the notion that interdependence is created by the complementarity of 'formal technical knowledge' (EE14). The importance of specialist expertise in shaping interdependent relations is also reported in the literature on management (Bourgeois & Eisenhardt, 1988; Ring & van de Ven, 1992), as well as that on construction management and economics (Hillebrandt, 1984; Smyth & Pryke, 2008).

As the main contractors were starting work on site to prepare for the ground works[64], the architects and planning authorities were working together to finalise the drawings so that both the clients' requirements and the planning permits would be accommodated. In Dale Lane (Case#1), the project manager for the main contractor '… again advised that suitable storage must be provided for refuse bins… [the client organisation] noted that there are mandatory [requirements] concerning bin storage that must be met in respect of the Code for Sustainable Homes' (MM04-W4/12-Case#1). Interdependence extended to organisations that one would not intuitively associate with the progress of building projects. Utility companies were reportedly the source of delays on site in Rowlett Road (Case#4), according to the main contractor, due to slow responses. This was reported at a meeting in February 2009 at which the 'contractors confirm[ed] all services and diversions ordered and awaiting response from service utilities' (MM07-W7/8-Case#4).

These examples illustrate interdependence among organisations within and across domains of expertise. I have intentionally presented here instances of interdependence that may be surprising to those less familiar with the design and build life-cycle. I have aimed to shed light on the complex architecture of interdependent inter-organisational relationships. Naturally, a large amount of interdependence would have been anticipated by the organisations. Plumbers and electricians always depend on the bricklayers before they can start work on a site. The main contractor will be dependent on a specialist sub-contractor for carrying out

[64] Ground works include foundations formed by beams and pillars made of concrete and steel, underground pipes (e.g. water), the lower ground floor – or sections – and pavements.

the demolition work (Case#6). Still, the integration of organisations, their expertise and their interdependence was critical.

Thus far, my analysis shows the heterogeneity of organisational expertise required in building projects, ranging from building to monitoring and planning. These organisations are bounded to interdependent relationships within and across domains of expertise. Coordination among the organisations is therefore required to ensure their purposeful alignment.

5.1.2. Coordination: How wise is old wisdom?

In this section, I begin my analysis of the coordination of inter-organisational relationships. Old wisdom is based on the prior literature on the coordination of inter-organisational relationships. One line of enquiry is the administrative mechanisms used (Lumineau & Quélin, 2012; Provan & Milward, 1995; Ring & van de Ven, 1994), and the second draws on the SNA to explore the link between coordination and the structural properties of inter-organisational relationships (Coleman, 1994; Granovetter, 1973; Uzzi, 1997). I follow these two leads to explain the cross-case differences in the consequences of coordination.

I explore my first lead based on the literature on administrative mechanisms of coordination. Specifically, I focus on two relevant dimensions that proved relevant to my research: contractual arrangements and monitoring organisations. Contracting entails a framework for developing relationships between[65] organisations (x_{ij}) (Grandori & Soda, 1995; Macaulay, 1963; Stinchcombe, 1985a). Across all seven cases, the architecture of coordination entailed a standard JCT Design and Build Contract[66]. The design and building works were all contracted for a *lump sum* price. I learnt more about this type of contract during my exploratory interviews with industry experts. One important reason for the wide use of this contractual form in the building industry (predominantly in small and medium-sized building projects) is the integration between the design and building stages. This integration is thought to foster collaboration between the design team (e.g. architect) and the builders (e.g.

[65] I use 'between' as prior research focuses mostly on dyadic relationships.

[66] This is a standard contract published by the Joint Contracts Tribunal (JCT), which is used in the UK building industry. This contract states the main contractor's basic obligation to carry out the works and complete the design identified in the contract documents, and the contractor's proposals which explain the detailed building methods and techniques to be adopted by the contractor to fulfil the employers' requirements. More information can be found at http://www.rics.org/ (Royal Institution of Chartered Surveyors; retrieved on 12/06/2012).

main contractor). The JCT Design and Build Contract also represents a low-risk option for the client in terms of over-budget building costs (since the main contractor is committed to a *lump sum* price) (Latham, 1994; Nahapiet & Nahapiet, 1985).

This view was consistently expressed in the board papers I read (recommendations made to the client about the financial viability and contractual arrangements before the decision to start any new project) across all seven cases[67]. As an illustration, the board paper for the Rowlett Road project states that 'The contractor will be signing a JCT Design & Build Contract, a fixed price contract [*lump sum* price], which will include all design and construction risks so limiting the group's [client] exposure to build cost increases' (BP01-Case#4). This instance illustrates that contractual aspects are enforced to safeguard risks (e.g. additional costs) and concerns over misappropriation by other organisations (e.g. overcharging for changes) (Williamson, 1996).

Contracting arrangements were also put in place among the organisations brought on to the sites. Specialist traders (e.g. timber contractors and plumbers) were employed by the main contractor. This form of contractual arrangement is often called sub-contracting (Eccles, 1981; Nahapiet & Nahapiet, 1985). Sub-contracting establishes relations of authority and dependence between the main contractor and third parties (i.e. sub-contractors) working on a project. The main contractor is held accountable by the client and its agent; the sub-contractors are accountable to the main contractor. An illustrative example can be observed in Rowlett Road (Case#4), a site located in public woodland near to a school, where the electrical sub-contractor required the main contractor to circulate the drawings for the design of CCTV (closed circuit television) and the intruder alarm to the client and its agents. The electrical sub-contractors were employed by the main contractor (and not the client) and the main contractor remained liable for the entire building project. Nonetheless, there was a relation of mutual interdependence between the main contractor and individual sub-contractors. Facing complaints from local residents – voiced by the local council – the main contractor to the Washbrook Road project sought to coordinate with sub-contractors in order to readjust the workload on site: '[main contractor] confirmed they were co-operating with the Contractors for that site and sharing common facilities – i.e. road sweepers' (MM01-W1/10-Case#7). Although

[67] I already mentioned this aspect of the projects in my methodology chapter (**Chapter III**) as part of the selection criteria used to obtain similar contractual frameworks across the projects.

such concerns were the main contractor's responsibility, the sub-contractors had to coordinate with the local council.

I will now direct my attention to contractual arrangements that formalise ties among organisations (x_{ij}). I first analyse the contractual framework. As stated above, this was the JCT Design and Build I all seven projects. The standardisation of contracting across cases offers an advantage when comparing cases because it limits the variances introduced by differences in contractual terms (Ariño & Torre, 1998; Lumineau et al., 2011). I therefore developed a coding system that captured where organisations were engaged in a contractual arrangement – defined as a relationship entailing a device (i.e., a contract) including rational planning with provisions and sanctions regarding performance (Macaulay, 1963, p.3). I established whether an organisation was in a contractual arrangement by consulting the project documentation (e.g. board papers) and, whenever required, by interviewing project participants (e.g. project managers). I coded each organisation as 1 if it was engaged in a contractual arrangement and 0 otherwise. I also computed the proportion[68] of organisations engaged in contractual arrangements. I called this figure the 'use of contracting'; it is given by the number of organisations engaged in contractual arrangements divided by the total number of organisations in the configuration (i.e. the whole building project).

My cross-case comparison shows substantial differences in terms of the use of contracting and the consequences of coordinating inter-organisational relationships (**Table 12**). The highest use of contracting (72.50%) was registered for the North Wingfield (Case#3); this project registered 'low' coordination of inter-organisational relationships[69] due to a delay of two weeks and extra costs of £155,000. By contrast, the Oakley Road (Case#6), where the organisations made the least use of contracting (27.50%), scored 'high' for coordination. There were no faults reported for this social housing project and it was delivered 'on time and on budget'. Comparing the Dale Lane (Case#1) and the Washbrook Road (Case#7), I observe that, in spite of only marginal differences in their use of contracting (50.00% and 52.50%, respectively), their coordination of inter-organisational relationships ranked 'low' and 'high', respectively.

[68] The proportions were converted in to percentages (by multiplying the proportion by 100).
[69] For the sake of clarity, I shall shorten the sentence *a 'low' score for the consequences of coordination of inter-organisational relationships* to '*low' coordination of inter-organisational relationships*. Hereafter, I use the latter expression instead of the former.

Accordingly, my tentative idea of an association between the use of contracting and the consequences of the coordination of inter-organisational relationships was promptly discarded. This lead from prior research on the administrative mechanisms of coordination appears to provide little explanation of the cross-case variances in the consequences of coordination. I therefore conclude that the use of contracting is not directly linked to the coordination of inter-organisational relationships (**Table 12**).

Table 12 Cross-Case Analysis of Coordination Mechanisms

Case study	Framework	Old wisdom		Overall*
	JCT Design & Build	Use of Contracting (x_{ij})	Managing Organisations ($_i$ and $_j$)	
Dale Lane (Case #1)	JCT Design & Build is a standard contract used in the building industry where the design and build are contracted at a *lump sum* price. Across all seven case studies, this contractual arrangement involved an agent of the client.	50.00%	15.00%	Low
Fulmar Road (Case #2)		70.00%	7.27%	Medium
North Wingfield (Case #3)		72.50%	17.24%	Low
Rowlett Road (Case #4)		32.50%	17.39%	High
Blyth Court (Case #5)		60.00%	9.09%	Medium
Oakley Road (Case #6)		27.50%	16.67%	High
Washbrook Road (Case #7)		52.50%	8.33%	High

* Based on the overall score of coordination consequences (**Chapter IV**).

Another lead that I wanted to follow, drawn from the literature on the administrative mechanisms of coordination, was the hiring of a monitoring organisation to act as 'network coordinator' (Davis & Eisenhardt, 2011; Provan & Milward, 1995; van de Ven & Gordon, 1984). The hiring of monitoring organisations is also part of the old wisdom in the building industry as project management consultants and quantity surveyors are often contracted to coordinate projects (Gann, 1991; Latham, 1994). It was no surprise, then, that in all seven social housing projects I found that monitoring organisations were employed by the clients to coordinate their projects (as I showed earlier). Unlike the contracting, which links two organisations (x_{ij}), the hiring of monitoring organisations endorses these

organisations to operate across the whole configuration of inter-organisational relationships ($\sum\{x_{ij}\}$). For instance, the client's agent is authorised to represent the client with the sub-contractors and the local council, even if this agent has not itself entered into a contractual arrangement with any of these organisations.

Monitoring organisations are third parties, hired to prevent opportunistic behaviour, potentially harmful to the client's interests, on the part of any other organisation engaged in the project. Signing off stages (of the project), an administrative procedure used to confirm the completion of all required (and contracted) works at every stage of the build, proved to be an important role performed by the client's agents. Formal project completion required all building stages to have been signed off by the client's agent, and approved by the local council's Department of Building Control. Payments were made by the client to the main contractor based on the progress on site, which was overseen by the client's agent throughout the design and build life-cycle.

In Fulmar Road (Case#2), after several pressing requests from the main contractor, the '[client's agent] stated that the final remediation sign off will not occur until the works to the imported soil are complete' (MM16-W16/18-Case#2). Throughout the design and build life-cycle, the role of the client's agent included the supervision of works, the enforcement of schedules, and the legal representation of the client with the wide array of contractors working on site. As project completion approached, the client's agent played a key role in checking the final work that was to be handed over to the client. In Dale Lane (Case#1), at one meeting the following note was made: 'Floor finishes and the like to be double checked to ensure that the right flooring is with the right tiles / kitchens etc – Action - client and employer's agent' (MM10-W10/12-Case#1). The client's agents were of pivotal importance for the coordination of inter-organisational relationships.

Monitoring was also carried out by specialist organisations due to the increased specialisation involved in building work nowadays and the requirements for new materials and techniques. The main example is perhaps the environmental sustainability consultants hired to provide specialist advice on buildings' environmental sustainability credentials as required by the policies of government funding agencies. Consider the implementation of the biomass system in North Wingfield (Case#3). Environmental sustainability consultants were hired to foster coordination among the client, the main contractor, the architect and the local

council. Coordination was required because the successful installation of the biomass system (a new technology for most of the organisations involved) depended on fluid information exchange during the design and build life-cycle.

Next, I coded all the organisations in all seven configurations of inter-organisational relationships according to their domain of expertise. I was specifically interested in the proportion of organisations whose domain was monitoring, that is, organisations whose main input into the projects was managerial such as the client's agent and the environmental sustainability consultants just mentioned. The proportion of monitoring organisations was computed in relation to the size of each configuration of inter-organisational relationships (i.e. the total number of organisations working on the project) and then multiplied by 100.

My findings show no association between this proportion and the overall score for the consequences of coordination, as **Table 12** shows. High coordination of inter-organisational relationships was found for some cases where there was high use of monitoring organisations (e.g. 17.39% for Rowlett Road - Case#4), but also where there was little use of monitoring organisations (e.g. 8.33% for Washbrook Road - Case#7). Interestingly, these two case studies registered the lowest and highest values for their proportions of monitoring organisations and yet both achieved a high score for coordination.

Thus, regarding my first lead from the literature on the administrative mechanisms of coordination, I show that the cross-case differences in the consequences of the coordination of inter-organisational relationships are (directly) related to neither the use of contracting nor the proportion of monitoring organisations involved. My findings are inconclusive compared to prior research as well as the accepted wisdom in the building industry regarding coordination among organisations.

I now turn to the second lead: the structure of inter-organisational relationships. The SNA posits that the structure of inter-organisational relationships shapes the possibilities and indeed the consequences of coordination (Coleman, 1994; Galaskiewicz, 1985; Gulati & Gargiulo, 1999; Uzzi, 1997). Prior research identifies density as a key factor that can explain coordination among organisations (Galaskiewicz, 1985; Gulati & Gargiulo, 1999). Hence, I explore the relationship between density and the consequences of coordination by building on the SNA that I used earlier to map the inter-organisational relationships. Following prior research (Zaheer & Soda, 2009), I computed the measure of density for all seven

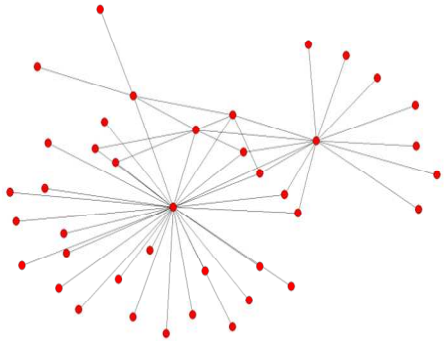
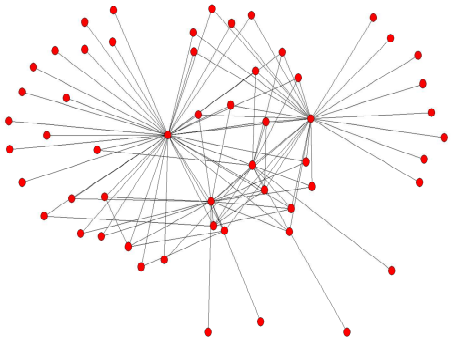
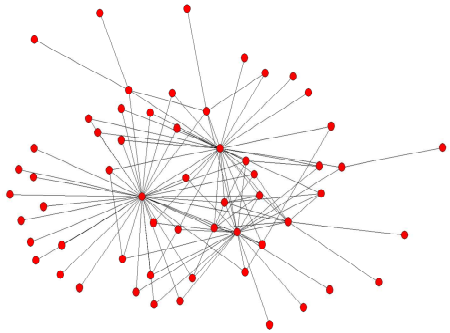
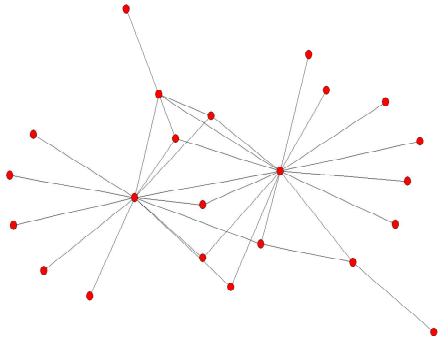
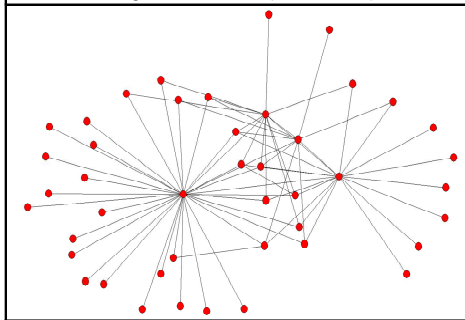
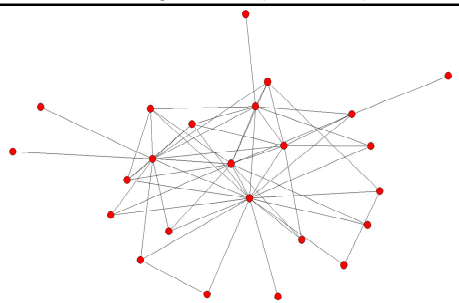
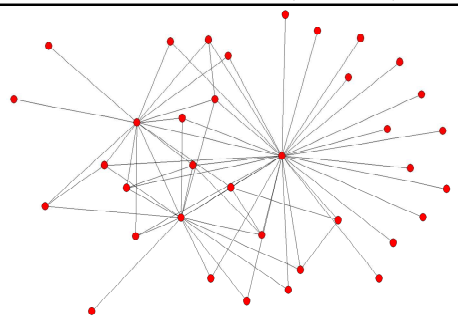
configurations of inter-organisational relationships using UCINET 6. (See **Appendix 3.1** for methodological procedures and a more detailed explanation of this measure.) The measure of density captures the number of ties between organisations. Density is proven to enhance coordination because dense configurations display cohesiveness based on trust-based ties and shared values and norms (Coleman, 1988; Uzzi, 1997).

My analysis shows substantial differences in terms of the structural attributes of inter-organisational relationships across case-studies (**Figure 12**). These differences can be observed at first glance by looking at the visualisation of the configurations of relationships across the seven cases. The structural attributes of IORs varied greatly even when the cases were of remarkable similarity. For instance, the Dale Lane (Case#1) and Oakley Road (Case#6) projects had substantially different configurations despite taking the same amount of time (14 months).

My analysis of the association between the density of inter-organisational relationships and the consequences of coordination shows mixed findings. Apparently less dense configurations of inter-organisational relationship are associated with a low level of coordination, as in the cases of Dale Lane (density = 0.187; overall coordination = low) and North Wingfield Lane (density = 0.169; overall coordination = low). However, the association is mixed where there is medium or high coordination (**Figure 12**). Consider Rowlett Road (Case#4) and Blyth Court (Case#5). These two projects show similar densities of inter-organisational relationships (Rowlett Road = 0.279; Blyth Court = 0.274); however, the former has high coordination and the latter medium. In other words, although organisations in both projects had multiple ties, their ability to coordinate differed.

I became progressively more interested in the hierarchical properties of the structures of inter-organisational relationships as the research went on. This was for two reasons: First, I observed aspects of hierarchy in the patterns of interactions among organisations (Stinchcombe, 1985a). Second, highly hierarchal structures are reported to hamper coordination (Grandori, 1997b; Okhuysen & Bechky, 2009; Thompson, 1967). The latter reason underlies the process of inductive research that I used, with prior research informing my quest for data (Eisenhardt, 1989). Yet, my observations about the practices of sub-contracting are part of an interactive process between data and theory in my search for how inter-organisational relationships are coordinated.

Figure 12 Cross-Case Analysis of the Structures of Inter-Organisational Relationships

Dale Lane (Case #1)	Fulmar Road (Case #2)	North Wingfield (Case #3)	Rowlett Road (Case #4)
			
Density: 0.187 Hierarchy: 0.954 Overall Coordination*: **Low**	Density: 0.258 Hierarchy: 0.592 Overall Coordination*: **Medium**	Density:0.169 Hierarchy: 0.729 Overall Coordination*: **Low**	Density: 0.279 Hierarchy: 0.753 Overall Coordination*: **High**
Blyth Court (Case #5)	**Oakley Road (Case #6)**	**Washbrook Road (Case #7)**	
			**Configuration of Inter-Organisational Relationships** $(\sum\{x_{ij}\})$
Density: 0.274 Hierarchy: 0.753 Overall Coordination*: **Medium**	Density: 0.469 Hierarchy: 0.564 Overall Coordination*: **High**	Density: 0.225 Hierarchy: 0.631 Overall Coordination*: **High**	

* Based on the overall score of coordination consequences (**Chapter IV**).

My analysis of the patterns of inter-organisational relationships appears to show aspects of hierarchy. This is clearer when it comes to the sub-contracting practices among the organisations, and holds for all seven cases. A typical example was the chasing of collateral warranties[70] from the sub-contractors by one client's agents (Fulmar Road, Case#2), which finally required intermediation by the main contractor. After four months on site, the client's agent 'noted that warranties are still required from the piling subcontractor and the beam and block flooring sub-contractor' (MM05-W5/18-Case#2). The collateral warranties were chased by the main contractor who had engaged in a contractual arrangement with each of the sub-contractors. This example suggests that interaction patterns adhere to the contractual arrangements among organisations. I find that such a pattern extends to other actions, typical in building projects. For instance, facing delays to the building of a fence at the North Wingfield site (Case#3) (which the client was concerned about because it was a hazard), the client contacted the main contractor, who 'confirmed the fencing sub-contractors would be commencing shortly' (MM06-W6/19-Case#3).

Drawing on these accounts, I became interested in the hierarchal properties of the structures of inter-organisational relationships. This illustrates the advantage of using an in-depth approach; I could build on the qualitative analysis to explore the structural properties of inter-organisational relationships further. First, the pattern of hierarchy I identified depicted ordered patterns of interaction; these resemble the notion of hierarchy developed within organisational theory (Simon, 1976; Thompson, 1967). Second, I found that the measures of network hierarchy captured the patterns I started to observe in the data.

I therefore computed the measure of network hierarchy based on a routine implemented in UCINET 6. (See **Appendix 3.1** for the methodological procedure and an explanation of this measure.) This was consistent with prior research using this measure of hierarchy to study hierarchies of relationships among individuals (Cummings & Cross, 2003), and at the level of inter-organisational relationships (Kenis & Knoke, 2002, pp.286-7)

[70] Collateral warranties are used with a third party (e.g. an architect or specialist sub-contractor) outside of the primary contract (e.g. with the main contractor). These third-parties need to warrant to the client that they will fulfil their duties under a building contract.

My analysis shows that the cases differ in terms of the hierarchies found in the structures of inter-organisational relationships. As far as the consequences of coordination are concerned, there appears to be a relationship between hierarchy and the consequences of coordination. Consistent with prior research (Kenis & Knoke, 2002; Thompson, 1967), this relationship appears negative. The Dale Lane (Case#1) is the most hierarchical (0.954) and is found to have low coordination, while the Rowlett Road (Case#4) display the least hierarchy and high coordination. Further investigation of this relationship shows there is a need for caution. The Blyth Court (Case#5) and the Rowlett Road (Case#4) show similarly hierarchical structures of inter-organisational relationships (0.753 in both cases); however, the former registers medium coordination and the latter high. A comparison of the Blyth Court (Case#5) with the North Wingfield (Case#3) project shows that the first has medium coordination and the second low despite similar levels of hierarchy (0.753 and 0.729, respectively). I therefore conclude that there is no (direct) relationship between the hierarchy of inter-organisational relationships and the consequences of coordination.

All considered, I found no (direct) association between the structural attributes of inter-organisational relationships and the consequences of coordination (**Figure 12**). Two identical configurations in terms of density and hierarchy, the Rowlett Road (Case#4) (density, 0.279; hierarchy, 0.753) and the Blyth Court (Case#5) (density, 0.274; hierarchy, 0.753), performed differently in terms of coordination (high and medium, respectively). Moreover, the Fulmar Road (Case#2) and the Washbrook Road (Case#7) also have similar figures for density (0.258 and 0.225, respectively) and hierarchy (0.592 and 0.631, respectively) but different figures for the consequences of coordination (medium and high, respectively).

Thus far, the tales from my study are intriguing: neither administrative mechanisms (i.e. contracting and monitoring organisations) nor the structural properties of inter-organisational relationships (i.e. density and hierarchy) explain the cross-case variances in the consequences of coordination. My findings show the limitations of conventional wisdom regarding such coordination. My quest has, however, relied on a static perspective. Prior research focused on ‘static’ configurations of inter-organisational relationships therefore conventional wisdom (from prior research) about their coordination is shaped by this perspective.

5.2. Coordination of Dynamic Inter-Organisational Relationships

In what follows, I present the turning point in my enquiry, which emerged from a longitudinal analysis of the inter-organisational relationships and the variations in the use of contracts and monitoring organisations. In order to investigate *how dynamic inter-organisational relationships are coordinated*, I took a longitudinal approach that entailed a month-by-month study of the dynamics of inter-organisational relationships, made possible through the use of over 1,700 pages of minutes from monthly meetings. This unravelled a fundamental interplay between action and structure: the use of contracting and monitoring organisations shapes hierarchy and density in dynamic inter-organisational relationships. Grounded in this interplay, I find, the coordination of dynamic inter-organisational relationships unfolds from two distinctive mechanisms: organising and relating. Organising emerges from the association between contracting and hierarchy, while relating stems from the association between hiring monitoring organisations and density.

Furthermore, my analysis unravels that the coordination of dynamic inter-organisational relationships over time hinges on the juggling of these organising and relating mechanisms. Indeed, the sequences in which these mechanisms were used over time proved to explain the cross-case differences in coordination consequences.

5.2.1. The Coordination Mechanisms of Organising and Relating

My findings suggest that, as organisations manage their coordination through contracts and monitoring organisations, they are simultaneously shaping the structure of their inter-organisational relationships. Unknown to the organisations, this interplay proved fundamental in explaining the success of their coordination attempts. Next, I will show how the organising and relating mechanisms unfold.

In building projects, perhaps like in any inter-organisational collaborative endeavour, the challenge is to coordinate inter-organisational relationships that are constantly changing (i.e. dynamic). As an architect advised me, ‘in construction projects, those networks [referring to networks of organisations] change quite dramatically from the beginning of the project through the main period of construction to the end’ (EI#3; founder of architect’s practice). The challenge is therefore to manage inter-organisational relationships over. As I showed earlier, the

conventional wisdom regarding coordination concerns the use of contractual arrangements and managing organisations.

Progressively, and building on my previous observation that sub-contracting appears to be related to hierarchical patterns of interaction among organisations, my data analysis led me to uncover how contractual arrangements and monitoring organisations shape the structures of inter-organisational relationships. I found that contractual arrangements induced hierarchy and the hiring of monitoring organisations triggered density. I argue that such an interplay entails two coordination mechanisms: organising and relating.

Organising is a coordination mechanism that I developed from an observed association between the use of contracting and hierarchy in inter-organisational relationships. Furthermore, my analysis shows that such a mechanism unfolds as a process whereby contracting induces control so as to attain goal-congruence among organisations and, in turn, leads to information control among organisations.

(1) Control among organisations occurs through contractual obligations and the setting of performance targets (Ring & van de Ven, 1994). Further exploration of the contractual relationship using the example of collateral warranties shows that contractual relationships play a key role in shaping the patterns of interaction among organisations. Contractual relationships give the main contractor influence over the sub-contractors. In Fulmar Road (Case#2), the main contractor warned that design changes introduced by the engineers concerning rainwater harvesting were impossible to accommodate. Notwithstanding this, the main contractor also clarified that '[the main contractor's engineering department] is in contact with sub contractors concerning these [issues] as individual rather than communal tanks is the preferred route' (MM08-W8/18-Case#2). This quotation shows how the practice of coordination acknowledged contractual aspects of the relationship. Furthermore, the use of the term 'sub contractors', instead of their actual names, shows the importance of contractual aspects (**Table 13**).

(2) Goal congruence stems from control insofar as targets are set for the completion of tasks at various stages of the design and build life-cycle. An important aspect of goal congruence found in this research was shown by the contents of contracting arrangements setting out obligations and expectations aimed at aligning the organisations involved. In April 2008, as the organisations were reaching the handover stage in Dale Lane (Case#1), the client became concerned about issues

regarding carbon land gas and retaining walls, which had to be resolved before the final drawings could be sent for consideration by the local council (i.e. Building Control) (MM02-W2/12-Case#1). In the light of this, the architect decided to amend the drawings, even though they had no contractual obligations to do so (this would have been the responsibility of the engineers). Later on, the client's agent advised, the 'architect has picked these up and allowances have been made in their costings'. One important aspect of this example is the role of contractual obligations and expectations as enforced through incentives and sanctions (**Table 13**).

Payments yielded a performance incentive in the sense that financial transfers to the main contractor were made according to on-site valuations. Monthly payments were made by the client to the main contractor, rewarding the progress on site. These were assessments of the value of the work carried out by the main contractor (financial transactions to the sub-contractors were then made through the main contractor, as further evidence of the contractual dependence). An account of this procedure was communicated to the main contractor in Rowlett Road (Case#4): 'schedule of valuation dates requested, targeted at mid-month dates for payment early the following months and co-ordinated with progress meeting dates' (MM01-W1/8-Case#4). Valuations were checked against cash flow maps and a progress timetable handed in by the main contractor. These documents were used as part of the contractual arrangement in order to evaluate the main contractor's performance.

(3) Information control describes practices of communication that resemble the dimension of control (as discussed above). In Oakley Road (Case#6), a 'contract instruction for the headwall to be issued following confirmation by the subcontractor that the quotation will stand' (MM06-W6/8-Case#6). This shows that the information passed between organisations resembles contractual arrangements among them (Stinchcombe, 1985). Furthermore, I found that the information flow reflected the contractual arrangements, such as those for the sub-contracting. This pattern in the data is illustrated by multiple instances of Collateral Warranties being chased. This is described by one of the project managers: '[the main contractor] circulated revised Warranties to [the client's agent], which will be required by [the client]. [The main contractor] to progress with consultants and sub contractors. [The client] to urgently return signed warranties from the beam and block contractor to [the main contractor]' (MM13-W13/19-Case#3). This illustrates a case of information flow adhering to ordered relationships based on contractual arrangements.

Table 13 Mechanisms of Organising and Relating

	Unfolding of Coordination in Dynamic Inter-Organisational Relationships			Mechanisms
	(1) Control	**(2) Goal Congruence**	**(3) Information Control**	
Use of Contracting	Control occurs through contractual obligations and performance targets. Sanctions for missing performance targets are included in the contracts.	Goal congruence stems from control aimed to align organisations. Payments rewarding progress on site (based on valuations) exemplify a control approach to goal congruence.	Communication among organisations resembles the dimension of control. Contractual obligations and performance targets define ties among organisations.	**Organising -** association between the use of contracts and hierarchy. Contracting is viewed as external to organisations. 
Monitoring Organisations	**(1) Monitoring**	**(2) Liaising**	**(3) Communication**	
	Monitoring is performed by organisations contracted to do so, such as project management consultancies. They monitor the activities of organisations based on anticipated task interdependence.	Liaising aims to reconcile differences among the parties and follows monitoring endeavours in order to attain a common goal.	Communication spreads across the configuration of inter-organisational relationships; this is driven by liaison roles. The driving force is from within the configuration through monitoring organisations.	**Relating -** association between monitoring organisations and density. 

Relating was found to be another mechanism of coordination; this stems from the association between the proportion of monitoring organisations used and the density of inter-organisational relationships. Unlike contracting, which is understood as an external force, monitoring organisations work within configurations of inter-organisational relationships and develop ties among organisations. They do so by monitoring and liaising, which explains the wide communication that typically takes place among organisations in dense configurations (**Table 13**).

(1) Monitoring is performed by third-party organisations mandated to link organisations together based on anticipated task interdependence throughout the design and build life-cycle. As one project manager told me, 'you are designing, planning…You know the project in the first place and you need to identify all of the relevant parties as early as possible, get them on board right at the beginning; you know any potential problems as early as possible' (EE03-Case#3). This captures the role of monitoring organisations. Because they are third parties to the project, they can foster ties between organisations that would otherwise be disconnected. They enjoy legitimacy when operating as intermediaries, as prior research shows (Krackhardt, 1998; Simmel, 1950). In North Wingfield (Case#3), the client confirmed with other organisations that '…[the building consultancy firm] will be undertaking the CDM-Coordinator[71] role… [Consultant's name] to commence H&S (Health & Safety) Plan as necessary' (MM02-W2/19-Case#3). The client thus gave the third party the go-ahead to influence other organisations' courses of action.

Monitoring was found to be especially important when new technologies, often related to green issues, were brought into the building process. In North Wingfield (Case#3), where a new biomass system was installed as part of the goal to achieve 'level 4' of the CfSH, the specialist consultant firm had a key role (BP01-Case#3). According to the data, the specialist consultants required the 'designs to be completed by [the biomass systems supplier] / [engineering firm] / [main contractor]'. Furthermore, the client's agent informed the parties that: "The completion is also determined by the works commencing to fit out the biomass house from the 22 October 2009 and being completed by the 17 November 2009. It was noted that the Boilers have still to be delivered to [engineering contractors], which need to be monitored by [client's agent and environment sustainability consultants]

[71] [Footnote added] CDM coordinators are project advisors, providing guidance to the client regarding matters of construction health and safety and risk management.

as this will determine the completion date for the project" (MM18-W18/19-Case#3). The specialist consultants thus enhanced the creation of ties among organisations – specifically, the main contractor, the biomass system manufacturer and the structural engineers. The specialist consultants then monitored the actions of the organisations, for instance, by checking that the works were completed within the time scales and liaising between them.

(2) Liaising refers to communication between parties to reconcile differences so as to proceed towards a common goal. Procedures used for liaising include *ad hoc* information processing and problem solving (Grandori, 1997, p. 903). Although it is a different activity, liaising stems from monitoring procedures. Following doubts about the feasibility of installing a biomass system in North Wingfield (Case#3) as part of the strategy for achieving level 4 of the CfSH (BP01-Case#3), the client and their agents liaised between the various organisations involved. The project reports and minutes of meetings show that the client's agent played an important role in ensuring that (a) the biomass system was installed and (b) communication among suppliers was improved to prevent further delays on site. Furthermore, my analysis shows that organisations with monitoring responsibilities delimitate spheres of activity for organisations, which is termed *sequential coordination* (Simon, 1976). This aspect is shown in the instruction from the client in Fulmar Road (Case#2) 'to speak to [environmental sustainability consultants] with regards to a Pre-assessment under the Code for Sustainable Homes being undertaken' (MM18-W18/19-Case#3). Liaising helped to develop ties among the organisations in this case (**Table 13**).

(3) Communication results from monitoring organisations' liaising role. The minutes of one meeting for the North Wingfield project recorded that '[environment consultants] met with [the main contractor] with regards to the ECO homes rating, [the main contractor's manager] is currently putting together the corresponding documents which will be sent to [environment consultants] for review prior to issuing to [specialist suppliers] for final assessment' (MM07-W7/19-Case#3). This provides a detailed account of the communication that went on among these organisations and shows the sequence of interaction among them and the tasks to be performed. In Dale Lane (Case#1), '[the client agents] advised [environmental sustainability consultants] have commented on the information provided to date in connection with the Code for Sustainable Homes. [Client's agent] to provide further info to [the environmental sustainability consultants] by the end of next week.

Design stage submission will be made to the BRE by the end of March 2009' (MM10-W10/12-Case#1). This confirms wide spread communication among organisations based on the intervention of monitoring organisations.

Having unpacked the mechanisms of organising and relating, I next conducted a longitudinal study of these mechanisms over time. I studied the relationship between the use of contracting and hierarchy (which I termed 'organising'), and I considered the relationship between the proportion of monitoring organisations and the density of inter-organisational relationships (which I termed 'relating').

Because such proportions are calculated in relation to the total number of organisations involved, comparing them across cases and over time can lead to bias. I addressed this issue by converting each proportion into a *z-score* to standardise them (See **Appendix 3.2** for methodology of *z-score* values.) A *z-score* gauges the variation in a given variable at any point in time against the average value of that variable such that negative values suggest a variation below the average while positive values denote a variation above the average. I computed the *z-score* values based on monthly calculations of the densities and levels of hierarchy in the configurations of inter-organisational relationships (see **Appendix 3.3** for monthly graphical representations). I present the monthly values of the relevant variables for the mechanisms of organising and relating across cases in **Appendix 3.4**. The visualisation of the inter-organisational relationships over time is enhanced by a multimedia file.

****

Multimedia File 1 Mechanisms of Coordination

****

The results of my *wave*-by-*wave* study of the standardised values show that the interplay between managing organisations to achieve coordination and shaping the structures of inter-organisational relationships occurs across the seven cases (**Table 14**). As the monitoring organisations intervened to coordinate the relationships among the other organisations, they were unknowingly shaping the properties of the configuration of inter-organisational relationships. On the one hand, variations in contracting were associated with a hierarchy of inter-organisational relationships. On other hand, variations in the number of monitoring organisations used were associated with the density of inter-organisational relationships.

Table 14 Longitudinal Study of Organising and Relating Mechanisms

Cases (n=7)	Mechanism	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	Effectiveness
Dale Lane (Case#1)	Organising	*	*	*	*		*	*	*			*									**Low**
	Relating			*	*	*	*	*	*				*								
Fulmar Rd (Case#2)	Organising			*	*						*				*				*		**Medium**
	Relating	*			*		*	*	*		*	*	*			*	*		*		
North Wingfield (Case#3)	Organising	*	*	*	*	*		*	*		*			*						*	**Low**
	Relating	*		*	*		*			*	*	*	*				*		*		
Rowlett Rd (Case#4)	Organising						*	*	*												**High**
	Relating		*	*	*	*			*												
Blyth Court (Case#5)	Organising		*	*	*	*		*	*												**Medium**
	Relating	*	*	*	*	*	*			*	*	*	*								
Oakley Rd (Case#6)	Organising		*					*	*												**High**
	Relating	*	*	*	*		*	*	*												
Washbrook Rd (Case#7)	Organising	*		*	*	*	*			*	*										**Low**
	Relating	*		*	*	*	*		*	*	*										

W – Wave (monthly observation point); unit of analysis for the variable time.
***** Organising: variations in the use of contracting and the presence of hierarchy are in the same direction; Relating: variations in monitoring organisations and density are in the same direction.
Sd Project phases: "Phase 1 – Design and start on site"; "Phase 2 – Structure and partitions"; and "Phase 3 – Fittings and handover".

Table 14 depicts the manifestation of the two coordination mechanisms, organising and relating[72]. In a nutshell, my analysis confirms that these mechanisms occur, as suggested in my qualitative analysis, on a near-monthly basis. In Blyth Court (Case#5), every month manifestations of both mechanisms appeared; in Oakley Road (Case#6), the mechanisms occurred in seven months out of eight. Furthermore, my analysis proved to hold regardless of the length of the project. In Fulmar Road (Case#2), coordination mechanisms occurred in thirteen months out of eighteen; in North Wingfield (Case#3), the findings are even more pronounced (in sixteen out of eighteen months). I also observed that the manifestation of these mechanisms was unrelated to the stage of the project (**Table 14**); this provides further assurance of the reliability of these findings.

All being considered, I have shown that, as organisations attempt to coordinate their operations, they are unknowingly shaping the structure of their inter-organisational relationships. This is important because it includes two mechanisms of coordinating dynamic inter-organisational relationships: organising and relating.

5.3. Juggling Coordination Mechanisms over Time

The question that remains is how, if at all, does the sequence in which coordination mechanisms are used explain the consequences of coordination across cases? In the conclusion to this chapter, I explore how the two mechanisms of organising and relating influence the consequences of coordination. My findings show that the sequence in which the mechanisms are applied explains cross-case differences in the consequences of coordination. In other words, I argue that the coordination of dynamic inter-organisational relationships requires those in charge to juggle both mechanisms.

I have developed a formalised summary of the juggling of coordination mechanisms in order to fully capture my findings (**Table 15**). Prior longitudinal research on coordination and inter-organisational relationships develops stages based on distinctive characteristics of the production process (Adler, 1995; Davis & Eisenhardt, 2011) or distinctive sets of theoretical mechanisms (Faems et al., 2008). I integrate both perspectives and define *stages* as distinctive sets of coordination mechanisms

[72] This is a stylised representation produced for the sake of clarity. In **Appendix 3.5**, I present a graphical representation of the monthly variations in the relevant variables underlying organising and relating.

throughout the design and build life-cycle. I end up with three stages that explain the cross-case variance in the consequences of coordination: mobilisation (design and starting on site), shaping-up (structure and partitions), and sustainability (fittings and handover)[73].

5.3.1. Mobilisation and Design of Relationships

The mobilisation of organisations and the design of relationships – at the early stages of the design and build life-cycle – occur through monitoring organisations rather than contractual arrangements. The relating mechanisms prevailed in cases of high and medium coordination, those with no extra costs or delays. In contrast, where the organising mechanisms prevailed, projects were delayed and extra costs were transferred to the client.

In the early stages, the organisations were required to create a new building. There was a creative element here since the organisations had to coordinate with one another in order to fulfil the concept-related demands of the local council. For the Oakley Road (Case#6), 'the original brief from [the local council] asked for a distinctive modern design with a significant street presence and this is to be achieved via the use of three storey flats …' (MM02-W2/8-Case#6). Similar requests were conveyed by the local council involved in Rowlett Road (Case#4), who sought a 'contemporary look to the scheme' (MM03-W3/8-Case#4). The organisations had to translate a concept into a design, which moved the coordination process across organisational boundaries, going beyond a mere assembling of organisational expertise. This was collective endeavour to perform tasks based on the interpretation of information yet to be converted into something concrete (e.g. drawings)

The relating mechanisms appear to be substitutes for contracting (the number of contractual arrangements fell as the relating mechanisms increased). In Oakley Road (Case#6), there was a close collaboration between the main contractor and the client's agent. This was noted by the client, who also mentioned having received referrals from partner organisations. This episode was noted in a board paper issued in February 2008: 'The [main contractor] submitted a price in line with [the client]'s budget and [they] are working closely with our cost consultants, [organisation's name], to arrive at a firm

[73] The stages are also shown in **Table** (grey shading).

tender price. Favourable references on [the main contractor] have been received from [the housing association from a neighbouring county] and [a local purchasing agent]' (BP01-Case#6). Previous (positive) experience of working together – familiarity – also explained the mobilisation of inter-organisational relationships. One example was the appointment of the quantity surveyors for the Rowlett Road project that was based on 'prior good experience' (BP01-Case#4). The client clearly demonstrated the role of familiarity when justifying the choice of these quantity surveyors to carry out the valuation of the plot of land and the respective building project located in Oakley Road. According to the relevant board paper, '[the quantity surveyors], who had previously provided professional valuation advice to [the client] at Acquisition stage, have now provided a report confirming the updated value of the site and units' (BP01-Case#6). According to prior literature, previous ties are thought to impact positively on the consequences of inter-organisational coordination as ties breed trust (Gulati, 1995a; Ring & van de Ven, 1994).

Trust-based relationships were found to be important in the early stages of the projects (**Table 15**). As the client was finalising the planning application for the Fulmar Road (Case#2), which already included drawings for the building, there was still an issue – the client was yet to own the land. However, the client trusted the verbal promise that had been made by the local council. This was communicated to the other organisations already working on the project (e.g. the architect, the main contractor and the solicitors) as follows: '[The local council] has verbally agreed with [the client] to sell the land to the Western boundary of the site at zero cost' (MM02-W2/18-Case#2). The formal requirements for transferring the land ownership were yet to be finalised, as it was further confirmed that '[the client was] to speak to [the client's agent] with regards to the arrangements for the land sale…and seek written confirmation from [the local council] with regards to the land purchase at zero cost' (MM04-W4/18-Case#2). The benefits of good relationships extended outside the network itself, for instance, to adjoining owners (**Table 15**). In Oakley Road (Case#6), the adjoining owner, a nationwide supermarket chain, confirmed to the main contractor that 'as a gesture of goodwill we [the supermarket chain] are prepared to offer you [the main contractor] part of the land by the culvert outside our car park area for your set up' (letter; MM02-W2/8-Case#6). This was important as the main contractor and the client were struggling to find a convenient set-up area.

The alignment of organisations was clearly visible in Oakley Road (Case#6), where the architects worked closely with engineers and the local council in order to accelerate planning approval. The architect explained that 'internal flat partitions had been designed as robust masonry (therefore requiring foundations) to secure an agreement from the EA as appropriate to minimising damage to the building in the event of flood' (MM01-W1/8-Case#6). Coordination enabled a joint redesign of the drawings in anticipation of the formal submission to the local council. Parking spaces and bicycle storage were relocated (**Table 15**). In the end, the project received planning approval within a short period of time, avoiding the delays that are a common hazard, as shown in a study of Norwegian offshore projects (Stinchcombe, 1985b).

Following the granting of planning approval for the Oakley Road (Case#6), eagerness to start on site was shown by the client and the main contractor. This project was long overdue given the existing shortage of social housing in the local area (PA01-Case#6; PA02-Case#6). The client's agent led the way, liaising with the architects to submit the outstanding 'third party validation of imported soils' to the local council as a matter of urgency (MM03-W3/8-Cae#6). The architects promptly coordinated with the local council, and a consensus was reached that the main contractor could indeed start on site regardless of the validation, although the architect was yet to hand in the outstanding documentation. The relational aspects lubricated the collaboration (Das & Teng, 1998) among the organisations in this instance, aiding their progress in the design and build life-cycle. Indeed, monitoring organisations often played a pivotal communication role that helped to save time in these projects. In Fulmar Road (Case#2), the client's agent required the architect to establish a timeline with the environmental sustainability consultants: '…[architect practice] to liaise with [environmental sustainability consultants] with regards to the effect, if any, that the proposed amendments to the internal layouts would have on the Code for Sustainable Homes assessment' (MM02-W2/18-Case#2). By doing so, the client's agent prevented any potential delays associated with the CfSH assessment, from the start, by ensuring that the relevant organisations had already made contact.

Table 15 Juggling of Coordination Mechanism in Dynamic Inter-Organisational Networks

	Mobilisation (*Design and Starting On Site)*		**Shaping Up** (*Construction*)		**Sustainability** (*Completion and Handover*)		**Overall***
	Coordination Mechanism	**Consequences**	**Coordination Mechanism**	**Consequences**	**Coordination Mechanism**	**Consequences**	
Rowlett Road (Case#4)	**Relating** prevailed. Positive effect on monitoring organisations. Importance of familiarity and monitoring organisations.	- Adaptability - design changes to meet demands by the local council; - 'Very Good' for environmental certification based on initial drawings (no further changes).	**Organising** prevailed although there were fluctuations in this over time. Specialist consultants worked closely with the client to align other organisations.	- Delays of five weeks on site (e.g. caused by slow progress with external cladding and internal boarding); - Work rearrangements on site with sub-contractors in order to recover delays.	**Relating** co-existed with **organising**, with monitoring organisations consolidating their leadership towards the end.	- Recovery of five weeks of delays; - Minor issues regarding landscaped areas and layout design.	**High**
	Relating →		**Organising** →		**Relating/ Organising**		
Oakley Road (Case#6)	**Relating** prevailed. Organisations mobilised at the design stage on the basis of referrals and familiarity as opposed to contractual mechanisms.	- Adaptability to provide 'contemporary' design required by the local council; - Search for redesign strategies to meet cost targets; - Goodwill	**Organising** prevailed where there was high contracting and hierarchy. Flexible management practices in place.	- Recovery of delays; - Specification changes; - 'Constant running over time'; - Adaptability on site to adopt new techniques and redesign work arrangements.	**Relating** prevailed, which led to a high density of inter-organisational relationships (organisations had multiple ties).	- Responsiveness to unforeseen aspects (e.g. site vandalism); - Minor delays, but they were recovered; - Agreement for minor extra works	**High**
	Relating →		**Organising** →		**Relating**		
Washbrook Road (Case#7)	**Relating** prevailed, followed by a pronounced increase in contracting and the density of inter-organisational relationships.	- High-quality relationships among organisations; - Adaptability – changes to design of foundations; - New layout solutions – e.g. parking spaces for disabled tenants.	**Organising** co-existed with **relating**; an increase in contracting was coupled with dense ties in a blend between relational aspects from the early stages and contractual-based operations.	- Redesign of work arrangements (once time frame was in place); - Delays were recovered – up to three weeks ahead of schedule; - Trust among parties.	**Relating** prevailed; density among organisations was sustained by contracting and monitoring organisations. Monitoring organisations counter-balanced the hierarchy induced by contracting.	- Delays recovered (three weeks ahead of programme); - Trust among parties (to enhance built-in environmental sustainability)	**High**
	Relating →		**Organising/ Relating** →		**Relating**		

(Table continues on next page) * Based on the overall score of coordination consequences (**Chapter IV**).

Fulmar Road (Case#2)	**Relating** prevailed. - Relevance of previous experience and cross-understandings; - Standardisation of work flow.	- Dialogue among organisations (e.g. client, architect and local council); - Operational issues – incompatibility of file formats used by organisations.	**Organising** prevailed despite an (exceptionally) high proportion of monitoring organisations (Wave 4) where contracting led to a hierarchy of coordination.	- Failure to recover from delays that were consistently reported; - Extra costs; - Miscommunications and delays to granting of planning permits.	**Organising** co-existed with **relating** mechanisms. Density was related more to contracting than actions by monitoring organisations.	- Delay of three weeks to the handover; - Over budget; - Several design misspecifications.	**Medium**
	Relating →		**Organising** →		**Organising / Relating**		
Blyth Court (Case#5)	**Relating** prevailed. Initial ties occurred mostly between the main contractor and a pilling (boring techniques used to build building's foundations) sub-contractor	- Prompt start on site and to demolition works; - Responsiveness in addressing emerging issues with existing infrastructure (this was a refurbishment project);	**No prevailing coordination mechanisms.** Co-existence of hierarchy of inter-organisational relationships and use of contracting alongside some trust-based ties.	- Detailed discussion of specifications – after unexpected problems; - (Mis)coordination across two sites, and design issues; - Misinformation about building's M&E services; - Delays on site.	**Organising** prevailed, with reduced use of monitoring organisations (management and consulting services provided by the client and their agents only throughout the project).	- Limited fluidity of information; - Light fittings missed some requirements; - One-week delay recovered (two weeks delay to handover).	**Medium**
	Relating →		**No prevailing coordination mechanism** →		**Organising**		
North Wingfield (Case#3	**Organising** prevailed due to increasing use of contracting. Involvement in multiple parts of the design stage.	- Clear specification of which organisations should attend meetings and the delegation of responsibilities; - Delays on site; - Rigidity in dealing with unexpected bore-hole on site.	**Relating** prevailed; contracting and hierarchy of inter-organisational relationships decreased	- Slow information flow; - Documentation missing, delays in planning approvals; - Redesign of sewers; - Poor adaptability involving new technology (biomass system) and building techniques.	**No prevailing coordination mechanisms.** Several issues concerning built-in specifications to accommodate the needs of disabled tenants.	- Scaffolding issues; - Biomass system: misspecification and misalignment among parties during design and installation.	**Low**
	Organising →		**Relating** →		**No prevailing coordination mechanism**		
Dale Lane (Case#1)	**Organising** prevailed, as shown by a large proportion of contracting arrangements.	- Intent/commitment to collaborate; - Design misspecifications (e.g. missing elements).	**No prevailing coordination mechanisms** **S**imultaneous use of contracting and monitoring organisations.	- Uncertainty ('mystery') about the SbD certification; - Slow information flow and lack of responsiveness to requests.	**Organising** prevailed; monitoring organisations did not trigger a density of inter-organisational relationships and contracts were breached.	- Failure to achieve SbD certification; - Disagreements; - Late handover	**Low**

5.3.2. Shape-Up through Organising

In the following phase, the coordination of dynamic inter-organisational relationships relied primarily on organising mechanisms as more organisations joined the projects (**Table 15**). The use of contracting and a hierarchy of inter-organisational relationships characterised the cases with 'high' coordination. The organising mechanism delivered an element of control and goal congruence following the mobilisation of the organisations, which enabled, for example, the recovery from delays on site.

A fundamental observation is that the use of organising mechanisms 'shapes up' inter-organisational relationships – that is, it provides a structure likely to facilitate coordination. The 'shaping-up' of the structure of relationships was revealed to be important for coordination in the transition from relating mechanisms as both the number and heterogeneity (in terms of expertise) of organisations on site increased. My analysis suggests that contracting and the imposition of a hierarchy were more effective for coordination as part of strengthening the relating aspect. This allowed a blend of organising and relating mechanisms of coordination to be used.

Once the work had started on site, several new sub-contractors joined the other organisations already working on the project, such as the main contractor, the engineers and the client's agent. Continuous alignment of these organisations was critical as the tasks on site became increasingly interdependent. Against this backdrop, organising mechanisms played a fundamental role since the combination of contracting and hierarchy acted as a safeguard against risk and the misalignment of organisations. Ring and van de Ven (1992, p. 487) similarly refer to 'the need to make decisions in the face of uncertainty of accomplishing tasks that require sustained cooperation with others, particularly when they represent difficult or novel ventures'. Across my seven cases of social housing projects, there was also an element of novelty since each building project was unique and, therefore, resulted in 'webs' of inter-organisational relationships particular to each case study[74]. The uncertainty was addressed through contracting, leading to a hierarchy of inter-organisational relationships.

There was a centralisation of decisions around organisations such as the main contractor and the client's agent. Hierarchy was in place insofar as there was a locus of decision making (van de Ven, 1976, p. 26). The relevance of the organising mechanisms

[74] A graphical representation of the configurations of inter-organisational relationships by month across the seven social housing projects is shown in **Appendix 3.3**.

for coordination was the development of goal congruence among the organisations as the ground works gave place to the erection of the building's structure. As the projects were progressing on site, contracting arrangements progressively modelled a well-defined hierarchy of inter-organisational relationships, which provided a 'platform' from which to direct organisations.

Anticipated interdependence resulted in assumptions about the tasks to be performed by the different organisations, as well as how those organisations would work together (through ties). Such assumptions provided an essential premise for the mandates of the monitoring organisations (Gulati & Singh, 1998). Organisations drew upon standard industry practices thought to be applicable at various points in time. In Dale Lane (Case#1), the main contractor '… again advised that suitable storage must be provided for refuse bins… [the client organisation] noted that there are mandatory [requirements] concerning bin storage that must be met in respect of the Code for Sustainable Homes and requested [that the architectural firm] check with their Code Assessor concerning this' (MM04-W4/12-Case#1). This quotation shows how the organisations based their operations on notions of anticipated interdependence.

The client's project manager for the North Winfield (Case#3) reinforced this control-minded perspective, suggesting that 'the things that should [be] known should be properly quantified … you should have a good set of drawings, prelims, specifications, schedules, and that suite of documents that spells [out] your task' (PI02-Case#3). The implementation of schedules contributed to a hierarchical arrangement of inter-organisational relationships, as well as some positive consequences of coordination, such as the recovery of delays.

However, intriguingly, delays on site were common even in cases where the project was handed over on time (e.g. Cases #4, 6 and 7). A distinctive feature of the cases of 'high' coordination of inter-organisational relationships, though, was the ability to recover from such delays. This occurred as a result of organising mechanisms that became the backbone of the coordination of inter-organisational relationships. In contrast, weeks of delays were not recovered in cases where a mix of coordination mechanisms were used (**Table 15**). Thus, it was not a matter of whether there were delays; instead, it was about whether the organisations could coordinate successfully to recover from those delays. The recovery of time resulted from a combination of changes in work arrangements and the quality of the relationships among the organisations.

A remarkable example of the recovery of a delay occurred in Rowlett Road (Case#4). In December 2008, the main contractor warned the client's agent and the local council that '5 week delays [were] anticipated' (MM06-W6/8-Case#6). The delays followed several design changes and inclement weather. As organising mechanisms prevailed in the project, the main contractor managed to recover the time that had been lost and the project was delivered on time and at no additional costs. Another example of the recovery of delays occurred in Washbrook Road (Case#7). Here, the recovery was spectacular, ending in project completion three weeks ahead of the agreed date. In July 2009, a revised programme showed that the project was two weeks behind (verbal project report given by the main contractor's project manager at a progress meeting; MM04-W4/12-Case#7). After this, the main contractor underwent a process of rearranging the work on site among the sub-contractors. A month later, the main contractor advised that the delay was being addressed through 'a revised plan to build Plots 22 and 23 houses concurrently with the flats' (MM05-W5/10-Case#7). In October 2009, the main contractor reported that 'the project was currently 3 weeks ahead of programme taking into account good internal progress and the roofing and external walling not being on the critical path' (MM07-W7/10-Case#7).

The 'good internal progress' was a consequence of the main contractor rearranging the organisations on site, instead of allowing the sub-contractors to coordinate among themselves as they had done previously. One technique used was to create sequences of work in different sections of the building (MM05-W5/10-Case#7). Initially, the sub-contractors were dependent on other organisations to complete sections of the building, e.g. plot 22. Under the new work arrangements, the main contractor required the sub-contractors to finish different sections of the building concurrently. By doing so, they were able to complete their work more quickly. However, consensus was also a fundamental aspect of the enhancement of coordination (**Table 15**).

Work rearrangements in the Washrook Road (Case#7) were possible because the organisations recognised and agreed upon the need to address concerns. Perhaps the primary factor that induced the change was related to the contractual terms in place; the main contractor would have experienced sanctions if there had been delays. The main contractor, in turn, had contract-based authority over the sub-contractors. Certainly, these contractual aspects would have helped to encourage the sort of coordination needed to deliver the project 'on time and on budget'.

Naturally, contractual arrangements are intended to align organisations (while preventing opportunistic behaviour and exposure to risk). However, in some of the cases looked at here contractual arrangements failed to align the organisations sufficiently that they could make up delays. In Fulmar Road (Case#2), delays in the early stages of the project were carried forward throughout the design and build life-cycle. This resulted in a handover that was delayed by three weeks.. Hence, consensus is not solely contract-driven (van de Ven, 1976, p. 1).

The organisations engaged in continual consensus-building in order to synchronise their actions. In Blyth Court (Case#5), the main contractor agreed to relocate the sockets only after it became evident that the installation, as it was, did not comply with planning regulations (MM04-W4/12-Case#5). In this case, consensus was induced by legally binding requirements, although it still required negotiation among the parties concerned regarding the correct course of action. The relationships among the parties proved to affect the coordination aimed at addressing unexpected hazards, such as design misspecifications. When the main contractor noticed a requirement for a 'false' door in order to address a design misspecification in the social housing development in Washbrook Road (Case#7), the client and the architect were reportedly 'confident the proposal to use working doorways will be accepted [by the local council]' (MM05-W5/10-Case#7). Such an optimistic perspective was based partly on the fact that this was a self-evident solution but also, and more importantly, because the organisations involved, namely the main contractor and the architect, were willing to work together.

The organisations often looked for cost-saving strategies to offset unforeseen costs. While the roof and external brick walls were completed in the Fulmar Road project (Case#2) during a sunny July[75], the client 'noted that due to possible additional costs that may be incurred, consideration should be given to finding any possible savings within the scheme' (MM11-W11/18-Case#2). The development of cost-saving strategies was important because it increased the threshold of costs that the organisations involved in the build, mainly the main contractor, could afford before extra costs would have to be passed on to the client.

Up to now, I have shown an emerging sequence of relating followed by organising mechanisms, associated with the cases with a high level of coordination.

[75] UK weather records by region are available at http://www.metoffice.gov.uk/climate/uk/stationdata/ (MetOffice - UK's National Weather Service).

5.3.3. Sustainability of Relating

In the last section, I observed some sustainability in the relating mechanisms underlying the coordination of dynamic inter-organisational relationships. In the cases with high coordination, the organisations operated in a dense configuration that followed on from the use of organising mechanisms of coordination. Interestingly, a low level of coordination occurred when the organising mechanism prevailed.

The relating mechanisms consisted of an array of actions that enhanced the coordination consequences following the process of shaping-up through organising (**Table 15**). The recovery of delays and continuous adaptability were pronounced. A recovery of five weeks was registered for the Rowlett Road (MM06-W6/8-Case#4). A recovery of delays also occurred in Washbrook Road (Case#7). I observed that organisations engaged in collaborative behaviour that was often based on relationships of trust. Because the inter-organisational relationships were densely connected, cross-understandings and trust behaviours developed. These dense configurations were a characteristic of those configurations where the coordination was found to be high. Thus, there was a link between the relating coordination mechanisms (i.e. dense configurations), trusting behaviours and time-saving effects. The importance of trust being embedded in inter-organisational ties in terms of the effect on time-saving is also reported by Uzzi (1997) in his study of the New York fashion industry.

Trusting behaviours were often exhibited as the organisations coordinated their endeavours when applying for certifications – the lead-up to project completion. A common example across the cases was the submission of documentation to the local council and the EA in order to obtain full discharge of the planning conditions[76]. This is necessary before a main contractor can proceed with the handover of a newly built social development. The time gap between project completion on site and the agreed handover date was often very tight (and sometimes shortened still further by delays on site). Thus, the organisations had a narrow time window in which to submit all of the required documentation. Given the time pressure, trusting behaviours and fluidity of information were essential components of coordination (Bechky, 2006). For instance, in Washbrook Road (Case#7), the main contractor anticipated that the formal BRE

[76] Planning permission is granted on the basis that specific conditions are met at the various stages of the building process (see **Appendix 1.2**). At each stage, specific planning conditions are discharged, that is the client submits the required proof that conditions have been met to the local council. These conditions vary widely across the country and are enforced by local council. More information can be found at http://www.planningportal.gov.uk

certificate would be unavoidably delayed, impacting upon the formal handover to the client. This was detailed in a meeting in December 2009: 'If [the main contractor] don't anticipate the final BRE certificates being available at handover, then the Code Assessor's letter confirming his visit just prior and that the project will achieve final level 3 certification would be acceptable' (MM09-W9/10-Case#7). Thus, an informal agreement among the organisations was critical.

Flexibility too was important for the organisations, for example, in carrying out the final work on the building – e.g. footpaths and landscaped areas. Beyond the faults in the building identified during the snagging process, minor work was often noted as necessary, even if there were no contractual obligations in this respect. In these cases, a high quality of relationships among the organisations (typical of dense configurations) was crucial. As an illustration, the main contractor in Oakley Road (Case#6) agreed to carry out work to relocate a footpath. This was proposed by the client when the project was near completion. Nonetheless, the main contractor agreed to it at no extra cost.

Relating mechanisms were also required to address concerns perceived as potential hazards, for example, to obtain the required certification (**Table 15**). In Blyth Court (Case#5), the relationships between the main contractor, the 'window man'[77], the client and their consultants were important as concerns were raised regarding the compatibility between the materials being used and the requirement for SbD certification. (This certification aims to prevent crime and requires numerous material specificities.) Both the main contractor and the 'window man' engaged in an exchange of information about the requirements in terms of materials and design. This was necessary because the windows and doors were being manufactured using a new technology. None of the organisations knew about the compatibility (and therefore compliance) of the materials with SbD certification. In the end, SbD certification was granted to the social housing development. In relation to the same certification, however, the story for the Dale Lane (Case#1) had a different ending. Although the client and their agent repeatedly asked the main contractor about their endeavours regarding the SbD certification – which was a contractual requirement – the matter seems to have remained shrouded in a degree of mystery. As I explained earlier in this chapter, SbD certification was not granted to this development because of coordination

[77] This was the language used in the minutes of the meeting (MM06-W6/12-Case#5).

problems between the main contractor and the local police. (I shall explore how coordination problems such as these unfolded in the next chapter.)

A key finding presented here is that the coordination of inter-organisational relationships is a journey, wherein the juggling of mechanisms is (at least) as important as the coordination mechanisms themselves. Together, the dynamic inter-organisational relationships in these cases were coordinated through a time-dependent combination of mechanisms. Cases with a high level of coordination shared the same sequence of coordination mechanisms: relating → organising→ relating. In cases of low coordination, other sequences occurred.

This chapter has shown, against the conventional wisdom, that the coordination of dynamic inter-organisational relationships hinges on an interplay between the action of coordination and the structures of inter-organisational relationships. Drawing on an in-depth longitudinal study, I have demonstrated the unfolding of two coordination mechanisms, that I have termed organising and relating. Furthermore, I have argued that the sequence in which these two coordination mechanisms were applied in the seven projects explains the cross-case variance in the consequences of the coordination of dynamic inter-organisational relationships. In the next chapter, I shall explore why there are coordination problems.

Chapter VI: Coordination Problems

Overview

Why do coordination problems occur in dynamic inter-organisational relationships? Given the scarcity of prior literature on this topic, I shall start by conceptualising the notion of coordination problems based on my extensive set of data, with which I was able to conduct a detailed monthly inventory of coordination problems – that is, a failure to align organisations or resources in a purposeful manner – across the seven cases.

My analysis revealed that the coordination problems stemmed from two mechanisms: contractual bottlenecks and organisational expertise-driven homophily. These mechanisms cause discontinuities to develop in the social fabric of inter-organisational relationships, the social fabric being defined as the structure (i.e. ties) and coordination-related 'qualities' of the structure (e.g. cross-understandings). My month-on-month study of coordination problems showed that these discontinuities are of three types: contract-induced, expertise-induced and 'break-up'.

In what is a puzzling finding – at least for me – my study singles out a paradox: the mechanisms that foster coordination can also lead to coordination problems under certain conditions.

6. Coordination Problems in Dynamic Inter-Organizational Relationships

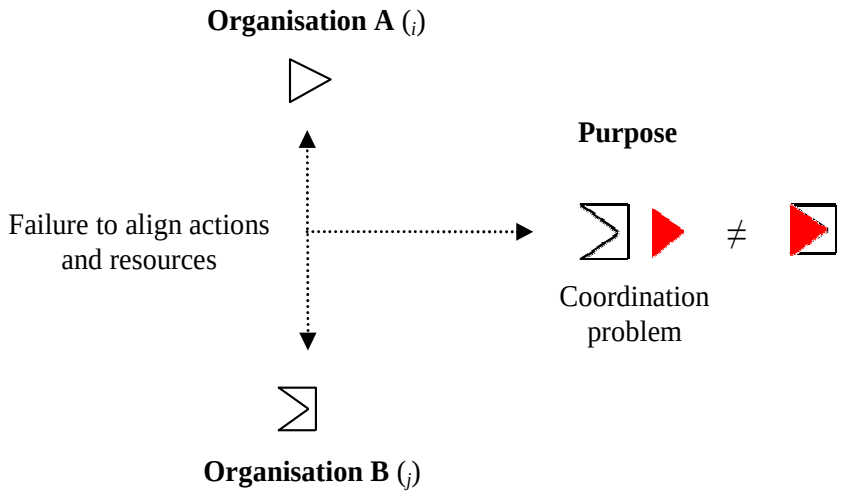
Building As I showed in the last chapter, I found that dynamic inter-organisational relationships are not always well coordinated. I also found that coordination problems recurred in all of the cases at various stages of the design and build life-cycle. In this chapter, I shall start by conceptualising coordination problems in the context of my study.

6.1. Coordination Problems – What are they?

Coordination Coordination problems are recognisable by the failure to align organisations and resources in a purposeful manner. I say 'recognisable' because the current literature provides only anecdotal examples of coordination problems (Heath & Staudenmayer, 2000; Kogut & Zander, 1996). I therefore felt the need to conceptualise the notion of coordination problems based on accounts from the minutes of meetings and projects reports. This option was advantageous because it avoided 'context-stripping' (Leonard-Barton, 1990) and addressed the lack of a definition in prior research.

The failure to align actions and resources becomes a 'problem' due to interdependence among organisations (Heath & Staudenmayer, 2000; Katila et al., 2008; Kogut & Zander, 1996). Accordingly, coordination problems represent a misalignment among interdependent organisations. As shown in **Figure 13,** coordination problems occur when at least two organisations fail to coordinate their actions and resources in a purposeful manner. The failure to fulfil the purpose is represented as a mismatch between the two symbols on the right of the figure (representing resources, such as organisational expertise and machinery), with the alignment between Organisation A ($_i$) and Organisation B ($_j$) failing to complete the 'square'.

Figure 13 Stylised Representation of Coordination Problems



I started my conceptualisation of the notion of coordination problems by building on the prior research, but then I moved on to using the extensive data I had gathered from the minutes of meetings and project reports, and this formed the main basis for my final conceptualisation. In line with inductive research (Eisenhardt, 1989; Glasser & Strauss, 1967), prior research alludes to 'coordination failures' (Podolny & Page, 1998; Williamson, 1991). Although instructive, I argue that 'coordination failures' are associated with the cessation of the inter-organisational relationships (e.g. alliances) (Ariño & Torre, 1998; Park & Ungdon, 2001) or the failure of the project (Mitev, 1996). Coordination problems lend themselves more to processual studies and refer to episodes of misalignment that do not necessarily lead to coordination failures[78]. My view of coordination problems is therefore akin to the omission of actions and resources throughout the collaboration process (Bechky, 2006; Heath & Staudenmayer, 2000) and to incompatibilities (or dysfunctionalities) across the network of organisations (Jones et al., 1997; Podolny & Page, 1998). Accordingly, I use these two dimensions as a starting point to investigate how coordination problems manifested themselves.

(1) **Omissions of actions and resources** covers 'forgetting' to submit documentation and misallocations of resources for performing required tasks (**Table 16**). A typical example was delays in planning approvals, as well as decisions on other planning-related aspects. Delays in planning approvals were common across several of the projects (e.g. Cases #1 and #7). Organisations often failed to circulate information relevant to the actions of other parties working on the project. Consider the design and

[78] I developed this argument in more detail in **Chapter II**.

installation of the biomass system in North Wingfield (Case#3). After several changes to the design features, various organisations had to develop collaborative relationships to address unplanned task interdependencies. In April 2009, '[i]t was agreed that [the main contractor] would discuss with [the engineers] and [the biomass system manufacturer] the involvement and appointment of [an environmental consultant who would] assist in the procurement of designs for the boiler house, ring main and installation [in] the properties for the ESCO [Energy Service Company]' (MM11-W11/19-Case#3). This episode dates back to the start of the project. The client, the client's agent and the main contractor made the assumption that the biomass system manufacturer would be supplying all of the necessary accessories. However, the biomass system manufacturer clarified later that the main contractor would have to manage the procurement process for the accessories.

Omissions often related to features being missed from drawings, preventing the fulfilment of the client's requirements or compliance with planning policies (**Table 16**). Such omissions often came at a cost for the organisations involved. In North Wingfield (Case#3), the main contractor and the architect failed to deliver a conservatory as requested by the client. According to the information I obtained, 'it was also confirmed by [the client's project manager] that [the client organisation] will accept the omission of the Conservatory; have the oven and hob provided to the wheelchair units at nil cost' (MM12-W12/19-Case#3). This example shows that the costs of the oven and the hob for the wheelchair units were passed on to the main contractor. This is an example of direct costs to organisations; however, omissions also accrue indirect costs. This can occur in the case of misplaced orders of supplies or misleading information about project specifications. According to the drawings for the Fulmar Road (Case#2), '13 tanks had been recommended. This was an error as a result of incorrect Engineer calculations. The actual required number of tanks is 18' (MM13-W13/18-Case#2). This error resulted in additional costs to the organisations; for instance, the main contractor had made its bid on the basis of thirteen tanks. However, the costs were absorbed by the client from a contingency fund, which is typical in these projects (these costs do contribute towards the figure for the extra costs in this project, though).

(2) **Incompatibility of actions** stems from poor coordination and unanticipated task dependencies (**Table 16**). This is widely reported in the literature on the building industry (Gann, 1996; Latham, 1994; Smyth & Pryke, 2008). My analysis finds several

examples of it. In Blyth Court (Case#5), ‘at the commencement of the works […] the report by [specialist consultant] was inadequate for the works, and [...] he had therefore commissioned a further report which had sited additional works and therefore the Asbestos Removal Costs had increased’ (MM02-W2/12-Case#5). Incompatibility of actions was common in the transition period between the design and building stages.

A typical example of incompatibility of actions is provided by so-called ‘buildability’ issues. These refer primarily to misspecifications in the design or design features that pose unexpected technical complexity in the building work. For example, the client’s agent for the Oakley Road (Case#6) confirmed that ‘changes to the roof design for “buildability” purposes have been made’ (CR05-Case#6). However, incompatibilities extended to work arrangements on the site, with some organisations incompatible with others. In North Wingfield (Case#3), the client’s agent ‘was concerned that the delays in the engrossment of the 278, 38 and 104 will start to affect programme. Furthermore, these delays will also affect services to site and potentially completion of the project based on the revised programme’. This example shows that the actions of various organisations must be coordinated because of extended interdependencies among organisations. The ultimate implication of coordination problems such as incompatibility of actions is potential delays to the project (**Table 16**).

The incompatibility of actions is reflected in decisions that affect the project (and might even compromise the intended outcomes). An example of this came to light through the client’s agent’s description of the submission of the application for the Sustainable Homes Code at Dale Lane (Case#1): ‘Level 3 Sustainable homes; Gas saver boiler offers up to 52% more efficiency; Mid terrace have solar panels and normal combi[nation], which kicks in if no heated water in the 90L tank from the solar power; 10 year product guarantee on solar panels; Low flow water taps throughout; Bin store for individual houses, communal for apartments; Windows/Door/Lighting are all Secure By Design but the site design does not comply’ (MM11-W11/12-Case#1). Although the organisations had managed to fulfil several requirements, environmental standards were jeopardised because some of the design features and materials failed to comply with Secure By Design (I shall discuss this example in more detail in the following section).

Table 16 Illustrative Evidence of Coordination Problems in Inter-organisational Relationships

Dimensions	Illustrative Evidence of Coordination Problems (Within Cases)	Summary (Across Cases)
(1) Omissions of actions and resources	'It was also confirmed by [the client's project manager] that [the client organisation] will accept the omission of the Conservatory; have the oven and hob provided to the wheelchair units at nil cost' (MM12-W12/19-Case#3); 'Revised drawings changing the car parking spaces were provided by the architect'; the main contractor argued 'the levels on these drawings do not work' (MM07-W7/12-Case#5); '13 tanks had been recommended. This was an error as a result of incorrect Engineer calculations. The actual required number of tanks is 18' (MM13-W13/18-Case#2).	Omissions cover technical specifications and coordination of tasks among organisations. Examples are 'forgetting' to submit documentation when it requires the involvement of multiple organisations.
(2) Incompatibility of actions (i.e. inadequate actions)	'At the commencement of the works … that the report by [specialist consultant] was inadequate for the works, and that he had therefore commissioned a further report which had [cited] additional works' (MM02-W2/12-Case#5); 'Changes to the roof design for "buildability" purposes have been made' (CR05-Case#6). 'The original planning application had to be withdrawn as planners were not happy with trees and parking facility being lost' (MM02-W2/10-Case#7); '… whilst it was accepted that a sub-station on site was unavoidable, its positioning near the flats entrances was not acceptable' (MM03-W3/10-Case#7); 'Location of soil and vent pipes were reviewed on site and alternative locations agreed' (MM03-W3/12-Case#5).	Incompatibility is recorded for interdependent tasks performed across organisational boundaries, e.g. planning authority, main contractors and architects. Incompatibilities are due to poor coordination and unanticipated task dependencies.
(3) Untimely alignment	'Biomass System designs to be completed by [specialist contractors] within timescales' (MM18-W18/19-Case#3); 'At the time of my [the local police] visit it became obvious that the site would not achieve the award due mainly to layout and orientation, which at this late stage could not be changed to meet the SbD criteria, so therefore it failed to achieve the [SbD] award' (EE01-Case#1); 'Application was submitted on 21.05.2010 … technical approval is required by 9 July 2010 if their programme is to be achieved' (MM05-W5/18-Case#2); '[Main contractor] confirmed that a Robust Details application has been registered. [Client's agent] stated [specialist consultants] are awaiting structural information from [structural engineers] who confirmed this would be issued direct by Monday 18th to [local council]' (MM02-W2/8-Case#6).	An emerging form of manifestation of coordination problems is untimely alignment. Across cases, agreed timescales define the requirements for coordination among organisations. However, organisations often have to wait for other organisations; this leads to delays on site and uncertainty about performance targets.

Note**:** Components (1) and (2) are based on the literature and component (3) emerged from my analysis

(3) **Untimely alignment** refers to situations where, although there might not have been omissions or incompatibilities, the interactions among the organisations were either not achieved at the right time, or were not appropriate for the situation. This is the final dimension of coordination problems, and it emerged from my data analysis.

A fundamental aspect of coordination among organisations during projects is the completions of tasks within agreed timescales. This is particularly important because delays in completing a given task can have repercussions for other parties, due to the mutual dependence of tasks and organisations. Therefore, monitoring organisations actively set deadlines. For example, the client's agent on the Fulmar Road (Case#2) advised that the 'application was submitted on 21.05.2010 … technical approval is required by 9 July 2010 if their programme is to be achieved' (MM05-W5/18-Case#2), illustrating the importance of timely interactions (**Table 16**).

A typical example of untimely alignment among organisations is provided by the application for SbD certification at the Dale Lane (Case#1). The organisations responsible were late in submitting their application for the SbD certification, even though it was a contractual requirement. This also caused difficulties in the certification of the building's environmental sustainability. These difficulties were flagged by the client's project manager, who 'advised that part of the code[79] requires achievement of Secured by Design' (MM01-W1/12-Case#1). The main contractor, the client and their agents, and the local police (responsible for issuing the SbD) failed to satisfactorily align their actions in time. I sought further information via email exchanges with the managers involved in this episode. According to an official from the local police, 'the development failed to achieve SbD mainly because of the non-interaction by the developer with myself' (EE01-Case#1). In a further email exchange, the official from the local police noted that the main contractor had only sought contact when the project was already near completion (EE01-Case#1). Thus, as the local police officer explained to me: 'At the time of my visit it became obvious that the site would not achieve the award due mainly to layout and orientation, which at this late stage could not be changed to meet the SbD criteria, so therefore it failed to achieve the award' (EE01-Case#1). The failure to receive SbD certification in this

[79] [Added by the author] The 'code' refers to the CfSH. Abridged names such as this are used frequently in the documentation across the case studies.

case occurred as it was too late to carry out the required changes in order to meet the certification requirements.

In summary, my analysis showed that coordination problems entail the following dimensions: (1) omissions of actions and resources, (2) incompatibility of actions and (3) untimely alignment. The third of these emerged from my data analysis and adds a nuanced perspective to our understanding of coordination problems (Heath & Staudenmayer, 2000; Podolny & Page, 1998), showing that the *timing* of the interaction matters.

The coordination problems mattered for two reasons: First, targets for the social housing developments were missed (e.g. SbD certification) and second, organisations spent additional resources. This was the case with the Dale Lane project regarding SbD certification. Speaking to the client (this was also confirmed by the local police officer), I learnt that the main contractor had appealed to the Association of Chief Police Officers (ACPO) after certification was denied. This action involved the resources (e.g. time) of the main contractor, as well as of the client, their agent and the architect. Everyone involved hoped that the decision to deny SbD would be overturned by ACPO (partially because it was a funding requirement). That did not occur, however. There were also relational costs since the relationships between the main contractor and both the client and the local council were jeopardised. The potential for the client and the main contractor to do business again in the future was therefore compromised (Gulati & Gargiulo, 1999).

Interestingly, coordination problems occurred despite contractual arrangements being in place. Contracts are regarded in prior research as an intended – or even desired – way of coordinating (Ring & van de Ven, 1994; Williamson, 1996). However, as shown, coordination problems did occur. This reinforces the pertinence of my last research question: *Why do coordination problems occur in dynamic inter-organisational relationships?*

6.2. Mechanisms of Coordination Problems

My analysis shows that coordination problems occur across the seven cases. Paradoxically, the underlying mechanisms of coordination problems originate in the very mechanisms used to coordinate the relationships. My findings show that

coordination problems stem from two mechanisms: contractual bottlenecks and organisational expertise-driven homophily.

6.2.1. Contractual Bottlenecks

The first mechanism refers to the control of communications on the basis of organisations' contractual relationships with one another (i.e. contract versus non-contract). Such control results from two micro-level processes: contractual homophily and contractual centrality. The former refers to organisations' tendency to create ties with parties that have similar contractual obligations (to the project) to their own, while the latter captures the control of information by organisations that occupy central positions in the configuration of relationships (**Table 17**). Contractual homophily and contractual centrality came to light as I analysed coordination problems in parallel with the structures of inter-organisational relationships[80]. This insight from the data is enhanced by a multimedia representation.

****

Multimedia File 2 Mechanisms of Contractual Bottlenecks

****

Contractual homophily came from my observation that coordination problems often emerged among organisations with a contractual relationship, for example between the client and the main contractor. Contractual relationships are called arm's-length ties to distinguish them from embedded ties (Uzzi, 1997). In this study, I want to use the notion of contractual relationships in a broad sense, namely, interactions involving organisations engaged in a contractual relationship that is not necessarily restricted to the parties belonging to the tie. Thus, a tie between the client's agent and the main contractor is regarded as a contractual relationship. Although these two organisations are not engaged in a contractual arrangement, both are working under contractual relationships specific to the project. This operationalisation is consistent with the distinction between 'contractual' and 'non-contractual' relationships (Macaulay, 1963).

However, other coordination problems occurred between organisations that were in contractual relationships and those that were in non-contractual relationships. Delays in gaining planning approval from the local council due to the misalignment

[80] See **Appendix 4.3** for month-by-month graphical representations of the inter-organisational relationships.

of actions by other organisations (e.g. the late submission of documentation by the main contractor and architect) are notable examples that involve non-contractual organisations. The authority of the local council is legally endorsed by the UK's legal framework (regarding planning permits) rather than by any contract between the parties, at least according to the legal meaning of the word 'contract'. Numerous coordination problems were related to changes in the layouts in order to meet planning requirements. The architects have contracts with their clients but not with the local council. Accordingly, coordination problems often involved both contractual and non-contractual ties.

I learnt of this aspect of contractual arrangements in more detail while talking to an architect (EE03-Case#5). He explained to me that, although contracts were used so as to prevent coordination problems, often they were not sufficient to do. Opportunism was frequently observed among the organisations on site. According to the architect, 'you [myself, seen as the client] have opportunism and that's the way the game is played because once you [have] signed the contract little can be done' (EE03-Case#5). This quotation shows the difficulty of changing either the contract or the terms of the contract, even if one party's actions are regarded as opportunistic. The architect added, 'if your contractor [client's main contractor] is wanting to charge you large sums of money for the mistakes that I [the architect] made, it says it's quite difficult to get another contractor, it's very expensive, very disruptive to throw them off [main contractor] and start again'. The interviewee was referring here to a rather common problem in the building industry: main contractors opportunistically seek to profit from design misspecifications, knowing that, once they are on site, it will be difficult for the client to replace them with other organisations. This difficulty arises from two factors: (1) it requires a contractual relationship to be ended and (2) it imposes extra costs on the client. As a result, the main contractor acquires a powerful position in relation to the client and their agents.

Once a design misspecification has been identified on site, one could expect that the main contractor and the architect would communicate in order to address the problem. Rather, the minutes of meetings provided many instances where the main contractor would interact with the client (these two organisations having a contractual arrangement) instead of the architect. If involved at all, the architect would coordinate with the client (as these two organisations also had a contractual arrangement). For instance, in Blyth Court (Case#5), the client became the

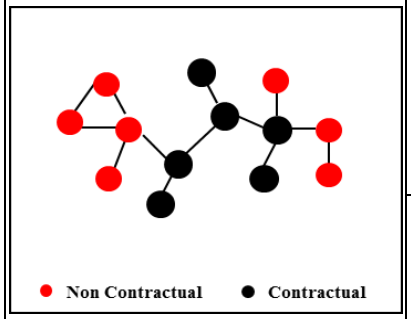
intermediary between the contractor and the architect to address the numerous design misspecifications, although the main contractor could have exchanged information with the architect directly. Instead of seeking alternatives, they demanded an extension to complete the project. This request was refused following advice from the client's agent (MM07-W7/12-Case#5).

Design misspecifications also illustrate another facet of contractual arrangements that helps to explain coordination problems. In the aforementioned examples, all the organisations were engaged in some sort of contractual arrangement. However, the coordination problems were more evident where coordination was required between organisations with a non-contractual relationship, such as the local council or the police. Recalling the example of the SbD certification at the Dale Lane (Case#1), an organisation with a contractual relationship to the project (i.e. the main contractor) failed to align its actions with an organisation with a non-contractual relationship to the project (i.e. the local police). The main contractor favoured interaction with organisations on site, where contractual obligations were directly enforceable. Perhaps it was a sign of over-confidence, but the manager working for the main contractor neglected a dialogue with the local police.

Accordingly, contractual relationships breed ties among organisations, that is contractual homophily exists. The coordination problems in the seven cases involved organisations with contracts and without. Numerous delays were registered (based on project reports) across the case studies regarding the connection of the sites to the national grid (e.g. water). Utilities were critical to the work on the sites, as well as to full operation of the buildings after completion. However, the utility companies had no contractual obligation to respond promptly beyond their moral and legal obligation to connect the site to the national grid within a reasonable amount of time.

In North Wingfield Road (Case#3), the main contractor and the client could not proceed with the preparation of documentation because of a failure 'to gain resolution of Street Names and Post codes from … Building Control for Wayside Close. [Main contractor, client and their agent] will continue to chase Building Control / Post Office for confirmation' (MM17-W17/19-Case#3). This represents a coordination problem insofar as the organisations (i.e. main contractor and client) faced a disruption to their workflow because of a lack of information required from one party. Indeed, there was a delay in confirming the postal addresses compared to the standard amount of time this usually takes across the building industry.

Table 17 Contractual Bottlenecks

1. Stylised View	2. Mechanism	3. Definition	4. Measure	5. Consequences	6. Illustrative Evidence
	**Contractual homophily**	Organisations with contractual arrangements form ties with other organisations with contractual arrangements, while those without contractual arrangements form times with others without contractual arrangements.	Based on E-I index (Krackhardt & Stern, 1988)	Contractual relationships shape inter-organisational relationships. Communication and willingness to coordinate in the seven cases reflected the awareness of contractual versus non-contractual arrangements.	- Design misspecifications and their correction (across projects); - The SbD application for Dale Lane; - Coordination with 'other' organisations, such as utility companies, e.g. to connect the site to the national grid.
	Contractual centrality	Organisations in a contractual arrangement occupy central positions in the project network.	Based on group centrality (Everett & Borgatti, 1999)	Organisations with contractual ties to the project also occupied central positions in the configuration of inter-organisational relationships. Centrality and contractual obligations contribute jointly to the control of information. This resulted in delays and additional costs.	- Slow responses between organisations when one was central and the other in a peripheral position; - Poor fluidity of information among organisations resulted in the need to reverse decisions and actions, e.g. relocation of the power station in Washbrook Road (Case#7).

* I use a stylised representation given the impracticality of presenting the graphical representation of the configurations of dynamic inter-organisational relationships for all *waves* and across all seven case studies. Additionally, the stylised visualisation enhances interpretation.

This illustration shows how organisations linked by a contractual relationship (main contractor, client and client's agent) aligned their actions but coordination problems emerged when they had to deal with organisations with whom they had no contract (**Multimedia File 2**). Gaining further understanding of the contract-related antecedents of coordination problems will require an additional methodological apparatus beyond what I have discussed so far.

I aimed to assess the extent to which organisations create ties to other parties that are contractually related to the project. To do so, I used a routine in UCINET6 to compute the E-I index (Krackhardt & Stern, 1988), which is a ratio of the number of 'external' (E) to 'internal' (I) ties. In my study, 'external' ties refer to ties between organisations in the 'contractual relationship' group and organisations in the 'non-contractual relationship' group[81]. 'Internal ties' are those between organisations within the 'contractual relationship' group. I call this my measure of contractual homophily. (Methodological details are reported in **Appendix 4.1**.)

Contractual centrality suggests that the central organisations in the configurations were contractually bound to the projects while those on the periphery were not. From the perspective of construction management and economics this is expected, as contractors, clients' agents and sub-contractors are all central to the project and have contractual relationships. However, my analysis sheds light on how one organisation's centrality and contractual relationships can help to explain the coordination problems that occur (**Table 17**; **Appendix 4.1**).

Centrality and periphery are important notions in configurations of inter-organisational relationships[82]. One organisation's position in the network is defined in relation to the number and diversity of ties it has with other organisations (Freeman, 1979). An organisation with few ties is generally situated away from the centre of the configuration. Those occupying central positions in the case studies included key organisations required to complete the seven social housing developments, such as the main contractor and the client's agent. In terms of coordination problems, though, organisations located in the periphery nonetheless had the capacity to bring the projects to a standstill. These organisations include the local council. Non-compliance with planning regulations was one example often

[81] This analysis builds on the coding of 'contractual relationships' that was presented in **Chapter V**.
[82] The notions of centrality and periphery are similar to the ideas of graph theory, which informs the visual representations of the configurations of inter-organisational relationships that are used in this study (as well as in other studies, regardless of the SNA software package used).

neglected by the organisations on site, for which the project was just about the construction process. This sometimes resulted in a partial vision of the project, which could challenge the integration of the workflow.

The interesting finding here is that organisations in contractual relationships occupy central positions (**Multimedia File 2)**. Thus, there is an accumulative effect in terms of the control of information: both centrality and contracts shape communication. Organisations in contractual relationships include those organisations key to the design and build life-cycle, and this is the case for every social housing development. Organisations such as the main contractor and the client's agent were bound by contracts, yet these organisations were also central in the configurations of inter-organisational relationships because of their key roles in the building projects.

Contractual centrality proved to play an explanatory role in terms of creating bottlenecks of information, and consequently coordination problems. Information among organisations was often shaped by both contractual terms and centrality within inter-organisational relationships. The first premise of this argument has been reported in the literature: centrality in inter-organisational relationships provides organisations with control over information (Gulati & Gargiulo, 1999; Walker et al., 1997). However, the central aspect in my study of coordination problems relates to the combination of centrality and being bound by contractual arrangements.

Both the contracting arrangements and the centrality of the organisations shaped the information that was required to coordinate the inter-organisational relationships. A lack of timely information accounted for many of the coordination problems. In several instances, delays to the work on site were observed to be due to the main contractor holding back information regarding the progress on site or about changes to material specifications. In several cases, too, they routinely failed to communicate with the local council. The main contractor was a central organisation but the local council was located at the periphery of the network of inter-organisational relationships. In Rowlett Road (Case#4), the main contractor was late in handing over documentation to the local council. The planning approval was consequently delayed for several days. Slow responses between organisations respectively operating at the centre and the periphery had implications for the progress on site. This was reported for the North Wingfield (Case#3): '[the architect] will issue drawings to Building Control to apply pressure on Building Control. Without

resolution [main contractor] will be “Potentially” [quotation marks as in the original] delayed in procuring service connections and meters to units on plots 4 – 16…’ (MM15-W15/19-Case#3).

Contractual centrality had severe implications in many cases, as the coordination problems proved to be costly. In the case of the (re)location of the electrical sub-station[83] for the Washbrook Road (Case#7), the main contractor had arranged with the utility company to locate a power sub-station to meet the power specifications for the full operation of the building. However, the location of the sub-station was promptly rejected by the client and their agent. Further to the instruction given by the client, the client’s agent informed the main contractor that ‘whilst it was accepted that a sub-station on site was unavoidable, its positioning near the flats entrances was not acceptable’ (MM03-W3/10-Case#7). The client justified the need for immediate relocation of the sub-station based on the potentially negative impact on the SbD certification. The main contractor had to establish further contact with the utility company to discuss the possibility of relocating the sub-station. Although the utility company agreed to this, the costs of doing so were transferred to the main contractor. The main contractor had to accept these costs given the lack of alternatives.

In summary, contractual bottlenecks, based on the micro-processes of contractual homophily and contractual centrality, explain the role of contracts in the development of coordination problems. This provides a perspective whereby contracts are studied in relation to the structure of inter-organisational relationships.

6.2.2. Organisational Expertise-Driven Homophily

The second mechanism of coordination problems relates to organisational expertise. Organisations tend to form ties with other organisations with similar expertise. This can be termed expertise-driven homophily (**Table 18**). For instance, managers working for the main contractors tended to interact with their counterparts working for the sub-contractors and had limited interaction with the architects and engineers. An essential aspect of effective coordination in building projects is the alignment of actions and resources among organisations across domains of organisational expertise[84].

[83] A power sub-station is a room that connects the building to the national grid.
[84] As I identified in **Chapter V**, I used: design, managing, building, engineering, planning and other.

Task-related interdependence across the seven case studies created an imperative for coordination among organisations. However, organisations tended to form ties with other parties carrying out similar functions in the building project. Coordination problems emerged when it was necessary to integrate different domains of organisational expertise from different organisations. Moreover, while similarity facilitated inter-organisational coordination, lack of similarity hindered essential integration across domains of organisational expertise.

Prior research suggests that organisations operating in similar organisational fields develop common heuristics (Grandori, 1997b; Hansen, 1999; Kogut & Zander, 1996) and knowledge-sharing practices (Kogut & Zander, 1996). In my study, I found that the main contractors experienced fewer problems communicating with the sub-contractors than, for example, with the architects. Previous research has shown that this also occurs in biotechnology companies involved in collaborative ventures to develop new products (Powell et al., 1996; Walker et al., 1997). Similarity – of industry, for example – implies the upholding of conventions and an industry-standard language that enhances communication among the parties.

I experienced the importance of similarity to communication myself when conducting exploratory interviews. Initially, I often had to ask for clarification of the terms used by the interviewees. Although terms such as PPP [Public Private Partnership], Stage C [Design, according to RIBA's plan of work stages] and M&E services are standard in the industry, I had difficulty in grasping this vocabulary in the early stages of my study. (I was used to thinking in theory-informed terms instead). Thus, similarity among parties enhances information transfer and communication, and similarity between the organisations enhanced the coordination of their inter-organisational relationships.

I often found coordination problems recorded between organisations from different domains of organisational expertise. Although similarity enhanced coordination, problems often occurred when organisations from different domains of organisational expertise were required to align their actions and resources. On the one hand, similarity of organisational expertise fostered coordination. On the other hand, the interdependence of the production process demanded coordinated operations among expertise-diverse organisations. The challenge, therefore, was collaboration among dissimilar organisations. This has been observed in other project-based arrangements across industries (Bechky, 2006; Maurer & Ebers, 2006).

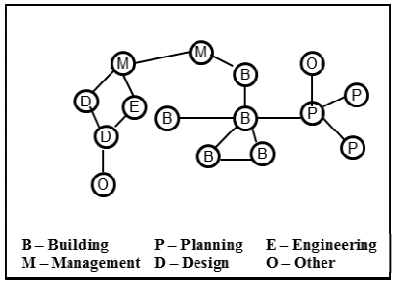
My cross-case analysis shows several instances of coordination problems involving organisations with different expertise. Still, the underpinnings of the coordination problems were often deeply embedded in the fabric of the inter-organisational relationships. One project manager suggested to me: 'you have got the technical problem of different languages and software packages that people use to interconnect. That was about communication language and how far you had to take data from its original, it's a metadata so that everybody could understand it and then it was reconstituted the other side' (PI01-Case#4). Language was entrenched in the terminology used in documents (**Table 18**). The issue of file extensions came up in several of my data sources. It was discussed by the client's project manager on the Fulmar Road (Case#2): 'All electronic drawing issues to be in DWF[85] format. In order to view, a DWF viewer (available online) is required to be downloaded. [Main contractor] to forward sample DWF file to [client] to ensure compatibility' (MM05-W5/18-Case#2). DWF files were passed on to the client by the architect for analysis and comments before the drawings were finalised.

Afterwards, the main contractor (through quantity surveyors and project managers) used these files to survey the work (e.g. square metres of floors, walls and quantities[86] of steel and concrete) required, which was important for the preparation of the bid. Once on site, the DWF files were consulted regularly to direct the overall progress, and to manage the work of numerous sub-contractors at every stage of the design and build life-cycle. Incompatibility of file formats could have resulted in misspecifications of the measures that the main contractor used to erect the structure of the building.

Communication and language played a critical role in the coordination of inter-organisational relationships since the organisations were required to combine their expertise. The required expertise was held by individuals from across numerous organisations, which sustained the interdependence of these projects. One organisation's ability to complete its tasks would be shaped by another organisation's actions.

[85] DWF is a binary format file published by AutoDesk and AutoCAD, specialist software packages used for drawing (e.g. buildings, pipework and landscapes).
[86] This is termed the 'bill of quantities' and is a detailed inventory of all the work and materials to be used to complete a project.

Table 18 Organisational Expertise-Driven Homophily

1. Stylised Visualisation	2. Mechanism	3. Definition	4. Measure	5. Consequences	6. Illustrative Evidence
	Organisational expertise-driven interaction	Organisations tended to form ties with organisations with a similar type of expertise (i.e. design, building, engineering, planning, management or other expertise)	Measure of homophily (Ibarra, 1992; McPherson & Smith-Lovin, 1987)	Problematic communication among parties, coupled with different languages and file formats among professionals. Delayed communication among parties. Disruption across the design and build life-cycle.	- Ordering the wrong amounts of material (e.g. tanks) due to misspecifications by other organisations; - 'Buildability' issues stemming from limited integration across domains of organisational expertise; - Poor fit or incompatibility between design and equipment in the flats.

* I use a stylised representation given the impracticality of presenting the graphical representations of the configurations of dynamic inter-organisational relationships for all *waves* and across all seven case studies. Additionally, the stylised visualisation enhances interpretation.

According to one interviewee, ‘architects in the UK don’t have formal technical knowledge like they do in the rest of the Europe, as it should be. I must admit, I have an adverse reaction to architects; I can’t stand them. They draw a couple of lines and they expect you to see the artistic implementation of it, and it’s complete nonsense’ (EI#14; Chief Executive of Professional Body). Although this opinion sounded quite extreme to me at the time, I learnt later that it was fundamentally about ‘buildability’.

‘Buildability’ is used in the building industry to refer to the feasibility of building all the features in the drawings (**Table 18**). Essentially, the notion of ‘buildability’ sheds light on the integration between ‘design’ and ‘building’. I observed that organisations often had to make minor changes to the layout – further to approval by the local council (i.e. planning control) – in order to improve ‘buildability’ on site. The issue of ‘buildability’ was referred to specifically in the main contractor’s progress report on the Oakley Road project in July 2008: ‘Changes to the roof design for “buildability” purposes have been made’ (CR05-Case#6). Several design changes were required by organisations with different domains of organisational expertise.

Limited coordination across different domains of organisational expertise led to additional costs for the organisations. The North Wingfield (Case#3) is a case in point. The design and installation of the biomass system was marked by several misunderstandings and miscommunications among the various specialists involved. However, there were many other examples. In Dale Lane (Case#1), delays in issuing the soft landscape proposal resulted in the late submission of documentation to the local council. The relocation of a BT (British Telecommunications) cable was severely delayed by the utility company, as a result of which the main contractor encouraged the client to seek advice from their solicitors (MM11-W11/19-Case#3; MM12-W12/19-Case#3). Thus, half-way through the project, the main contractor had to reschedule and rearrange the workload on site as the cable needed to be removed in order to complete the roof infrastructure. The delay was a further problem for the main contractor as it was trying to recover progress on site after several other delays that had affected the ground works. At the same time, the main contractor and the architect were informed by the water company of several design changes that would be required in order to achieve connection to the water main. In this case, the building work by the main contractor was already underway when the ‘back-track’ was required in order to accommodate the new design specifications.

These two examples demonstrate more than just a coordination problem, though; indeed, they represent a disruption across the design and build life-cycle whereby building started to precede design. In other words, the form (i.e. the building) was followed by the concept (i.e. the design). The coordination problems resulted in fundamental changes to the industry-standard flow of work and arrangements on site. This was also the case when the boilers in several flats in Oakley Road (Case#6) had to be relocated in order to create space in the layout. In this case, the building work (i.e. the installation of the boilers) preceded the design (i.e. the redesign of the layout for every flat) in another example of a disruption occurring across the design and build life-cycle. Here, it was due to a coordination problem between the architect and the main contractor. Also, the architect and the supplier of the boiler had failed to discuss the actual dimensions of the boiler. Consequently, insuffient room was allocated in the drawings submitted to the local council for planning permission.

A measure of organisational expertise-driven homophily must necessarily be built on prior research on homophily (Ibarra, 1992; McPherson & Smith-Lovin, 1987). The measure of homophily is typically used to capture individuals' tendency to seek interactions with other individuals of the same gender and similar ethnicity (Ibarra, 1992). This reasoning can be extended to the organisational level: interactions among organisations are driven by a similarity of industry background and mission (McPherson & Smith-Lovin, 1987). Accordingly, I computed a measure of organisational expertise-driven homophily that captured organisations' tendency to establish interactions (i.e. ties) with other organisations of similar expertise. This tendency was defined as the number of ties an organisation had with other organisations with similar expertise. Six categories of organisational expertise were used: design, monitoring, building, engineering, planning and other (as defined earlier in this thesis). A high score for this measure would suggest that the organisations in these case studies tended to create more ties with other organisations with similar organisational expertise to their own. (See **Appendix 4.2** for methodological details.)

Thus far, my findings suggest that coordination problems originate from two theoretical mechanisms: contractual bottlenecks and organisational expertise-driven homophily. Paradoxically, coordination problems stem from actions intended to coordinate dynamic inter-organisational relationships. For example, contracts foster contractual homophily and contractual centrality. Similarity of organisational

expertise often degraded the integration required across the design and build life-cycle. Altogether, these mechanisms of coordination create discontinuities in coordination-driven action across configurations of inter-organisational relationships.

6.3. Discontinuities in the Inter-Organisational Fabric over Time

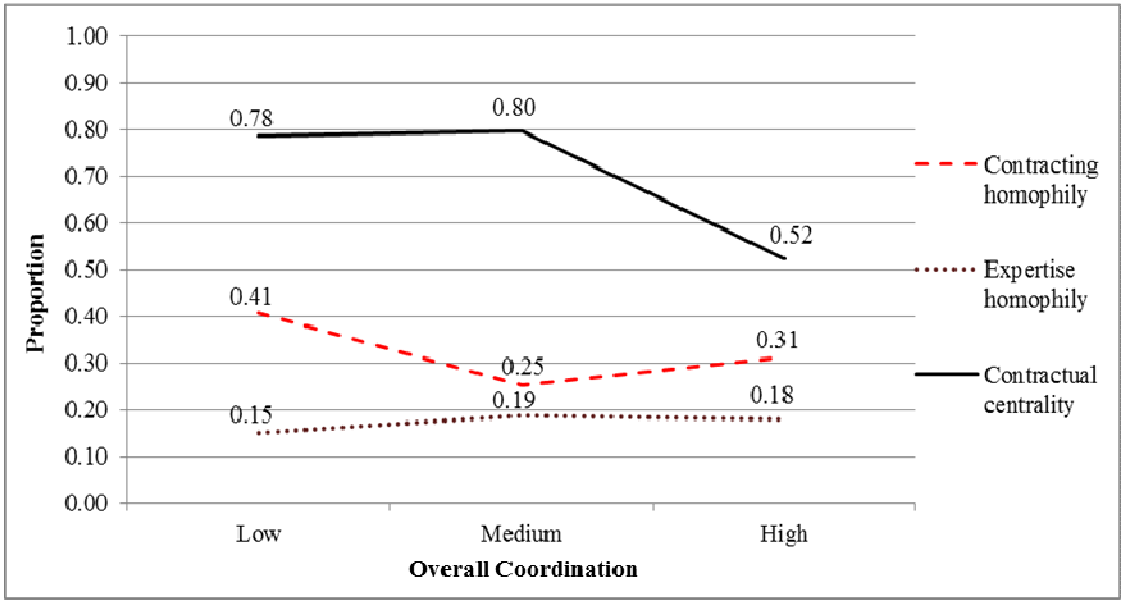
In the remainder of this chapter, I will explain how the mechanisms of coordination problems described above foster discontinuities in the inter-organisational fabric that in turn harm the alignment of resources and actions within the configurations. I conducted a month-on-month study of the coordination problems across the seven cases, based on the 'measures' of coordination problems developed earlier in this chapter. My aim was to map how these mechanisms unfold over time as the configurations of inter-organisational relationships change. Over time, the coordination problems proved to be explained by discontinuities in the inter-organisational fabric. The notion of a 'fabric' reaches beyond the idea of a structure of inter-organisational relationships, as it also includes qualities of that structure.

In a preliminary study, my cross-case analysis shows a strong association between the coordination problems and overall coordination[87]. The aggregation of the data according to the overall score for coordination provides robustness to my analysis. As shown in **Figure 14**, contractual centrality – where organisations bound by contractual relationships also occupy central positions – is substantially lower (0.52) in configurations where a high level of coordination was attained (Cases #4, 6 and 7) than in cases of low (0.78) and medium (0.80) coordination.

Contractual homophily – where organisations in contractual relationships tend to create ties among themselves – is also higher (0.41) when overall coordination is low than when it is high (0.31). However, cases of medium coordination are found to have the lowest contractual homophily (0.25). Finally, organisational expertise-driven homophily is found to have limited variance (0.15 to 0.19) across the three levels of coordination. Overall, these findings support my analysis of the mechanisms of coordination problems.

[87] Based on the overall score of coordination consequences (**Chapter IV**).

Figure 14 Relationship between Mechanisms of Coordination Problems and Overall Consequences of Coordination



Note: The values for the three mechanisms of coordination problems were averaged across the case studies in each category of overall coordination (low, medium and high). They are comparable because all range between 0 and 1.

My next step of analysis entailed a month-by-month study of the mechanisms of coordination problems, across the seven configurations of dynamic inter-organisational relationships. In order to do so, I juxtaposed the coordination problems with their mechanisms. The result was a fine-grained view on the discontinuities in the fabric of dynamic inter-organisational relationships. Consistently, over time and across all seven configurations of dynamic inter-organisational relationships, the discontinuities underlying coordination problems were of three types: organisational expertise-induced; contract-induced and 'break-up'.

6.3.1. Contractual-Induced

Contract-induced discontinuities in the fabric of inter-organisational relationships were formed by contractual bottlenecks (i.e. contractual homophily and contractual centrality). Positive variations[88] in contractual centrality and contractual homophily were found to be a sufficient predictor of coordination problems throughout the design and build life-cycle (**Table 19**). Contract-induced

[88] Consistently with prior analyses in this study, I measured this variation using *Z-Scores*. These assess the variation of a variable at a given point in time against the average of that variable over the entire period of observation.

discontinuities relate to the role of contracts in the development of coordination problems. Based on an in-depth longitudinal analysis, periods of increased contractual bottlenecks are consistently associated with coordination problems.

Consider the Blyth Court (Case#5). In the initial six months of the project, there were positive variations in contractual homophily and contractual centrality (**Table 19**). This suggests that contractual bottlenecks were in place (within the configuration of inter-organisational relationships). The outcomes included several coordination problems; for instance, miscommunications among personnel working for key organisations (e.g. the main contractor and architect). In *wave 4*, the inventory of coordination problems ranged from confusion about the lift and firing system involving the client's agents, engineers and architects to the ordering of M&E sub-contractors. This prevented the discharge of planning conditions due to outstanding information. Another example of coordination problems associated with contract-induced discontinuities is the timeframe between *wave 3* and *wave 5* in Dale Lane (Case#1). This was a critical period for the project: the transition from the design to the build stage. Nonetheless, there were substantial positive variations incontractual homophily (*wave 3*, 2.225; *wave 4*, 1.065; *wave 5*, 0.285), which proved to be associated with numerous coordination problems (**Table 19**). In *wave 4*, the project manager for the main contractor was late in handing information over to the client. At the same time, the manager for the client was concerned about poor communication between the main contractor and the architect, which is essential in easing the transition from the design to the building stage. Coordination problems were growing, with implications for the work progress on site.

An important element of this analysis concerns the role of contractual relationships. All these organisations – engineers, architect and the client's agents – were contractually bound to the project. However, the contractual terms did not always result in the alignment of contractual relationships. These organisations in contractual relationships demonstrated limited coordination with organisations that were not contractually related to the project. Where the contracted organisations did work together, several coordination problems nevertheless emerged regarding information control. For instance, the main contractor on the Blyth Court (Case#5) failed to provide detailed information about health and safety issues; the file submitted to the client failed to comply with legal requirements. It was to industry standards, though. Collateral warranties from the engineering firms were delayed

despite several requests being made by the client and their agent. This was noted in the minutes of a meeting in February 2010, in which the client's agent 'suggested that [the main contractor] liaise with [the client] for the required format of the H&S [health and safety file]' (MM11-W11/12-Case#5). Additionally, the building costs of refurbishing Blyth Court were disputed by the main contractor; the costing of project reports and cash flows needed clarification. The main contractor claimed that there was unforeseen work that needed to be added to the agreed *lump sum*. The consequences of contractual bottlenecks were not just poor coordination due to limited contractual relationships. Surprisingly, contractual bottlenecks were also associated with coordination between organisations that were contractually bound to the project. Although ties were created among organisations, such interactions did not always prevent coordination problems.

A long-term sequence with several coordination problems and contractual bottlenecks was observed between *waves* 11 and 17 for the configuration of inter-organisational relationships in Fulmar Road (Case#2). Notably, *waves* 11 and 12 registered a positive variation in contractual homophily and contractual centrality (**Table 19)**. Organisations witnessed several delays involving, for example, the main contractor and the sub-contractors, the architect and the client. All these organisations were engaged in contractual relationships. For instance, the main contractor had signed a contract with the client. Still, there was degradation in coordination between these different domains of organisational expertise.

In Fulmar Road (Case#2), there were several ongoing issues between the main contractor and the local council, such as delays in obtaining planning approval. The client and the main contractor failed to provide site layout/setup details to the local council. Communication between these two organisations was disrupted, which had implications for progress on site, for example requiring rearrangements of work and schedules. Then, changes to the existing design were required in order for the project to achieve compliance with planning requirements. This caused problems for the main contractor, which was concentrating on collaborating with several sub-contractors at the time, in an attempt to recover from delays. Rescheduling the work affected the payments it received (from the client) because of the poor progress on site. These sanctions (missing payments) were part of the contractual agreement, and were based on monthly valuations carried out by the client's agent. After weeks of discussions about the most efficient system to improve the building's environmental

credentials, the biomass system was chosen. However, according to those involved, this impacted negatively on the progress of the work on site, due to the technical requirements as well as the need for several organisations (specialist sub-contractors and local council) to liaise with one another.

Hence, contracts seem to have induced discontinuities in the fabric of inter-organisational relationships on these projects. Organisations fail to align resources and actions, even if there were (1) contractual relationships between organisations and (2) ties among organisations. Thus, the presence of discontinuities goes beyond the mere absence of a tie. Although a tie might exist, organisations can still lack goal congruence and the consensus needed to coordinate. According to my analysis, the lack of goal congruence and consensus was associated to the contractual bottlenecks. The coordination problems can be explained by the contractual aspects of the relationships among the organisations.

Table 19 Coordination Problems: A longitudinal cross-case analysis

Dale Lane (Case#1)						
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**
Contr. Homo.	-1.084	0.334	2.225	1.065	0.285	-0.869
Contr. Centr.	0.289	-3.175	0.289	0.289	0.289	0.289
Org. Exp.	0.739	1.641	-0.613	-1.514	-0.803	0.944
Coordination Problems	i) Design misspecifications; ii) complaints from the local residents about work on site	i) Local council demanded changes to design features (due to planning regulations); ii) ongoing discontent expressed by locals	i) Remaining (minor) issues with drawings, but planning approval was granted	i) Main contractor was late in handing over the necessary documentation to the client; ii) negative impact of some design features on CfSH certification; iii) misplacement of the gas board; iv) architect failed to send drawings to the main contractor; v) poor communication between architect and main contractor (as noted by client's project manager)	i) Changes required to material details; ii) client's project manager felt that main contractor was neglecting the SbD certification	i) Design changes due to misinformation on location of solar panel; water storage tank impacted adversely on the storage space

(Continued)

	Wave 7	**Wave 8**	**Wave 9**	**Wave 10**	**Wave 11**	**Wave 12**
Contr. Homo.	-0.296	-1.421	-0.611	0.334	-0.296	0.334
Contr. Centr.	0.289	0.289	0.289	0.289	0.289	0.289
Org. Exp.	-1.514	0.417	0.289	0.289	0.739	-0.613
Coordination Problems	i) Design changes had to be made to the initial project in order to comply with planning regulations; ii) SbD certification was at risk (due to poor communication between main contractor and local council); iii) main contractor reports, 'have received two differing responses from the police concerning the scheme' (MM06-W6/12-Case#1)	i) Main contractor awaits SbD officer site visit; ii) architect, engineer, timber frame sub-contractor and plumbing and heating sub-contractor failed to provide necessary documentation; iii) main contractor fails to meet the requirements regarding the H&S file format	i) Delay to revised soft landscaping layout because of late agreement on the use and maintenance of external areas; ii) SbD was denied due to the lack of natural surveillance of the car park areas (this was both a contractual and a funding requirement); iii) client was unaware of some design changes; iv) disagreement between the client and the main contractor regarding the efforts to achieve SbD; v) client's agent stated that the main contractor was falling short on obtaining assurance from the Building Control officer regarding the building's level of access	i) 'Spotting was coming through the decorations to the walls and ceilings' (MM10-W10/12-Case#1)	i) Fire brigade officer was against the provision of a 'mesh cage' in front of the electric meters (MM11-W11/12-Case#1); ii) minor defects found	i) Minor concerns about management arrangements between the client and the local council; ii) locals raised concerns about safety in the area

(Table continues on next page)

Fulmar Road (Case#2)										
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**	**Wave 9**	**Wave 10**
Contr. Homo.	1.342	1.106	0.023	-1.193	-0.181	1.382	-0.499	0.417	-1.675	1.605
Contr. Centr.	-0.210	-1.347	0.699	0.699	0.699	0.699	0.699	0.699	0.699	-0.210
Org. Exp.	-0.784	-0.592	1.859	0.742	-0.592	-0.838	0.907	-0.336	2.357	-0.059
Coordination Problems	No coordination problems reported	i) Changes to the drawings; ii) organisations could not access the drawings because of the file format; iii) HA opposed the use of soak ways underneath adopted highways (this had been a design/engineering decision)	i) Uncertainty over whether commuted sum applied; ii) gas governor placement - a problem for other tenants living in close proximity to the gas governor	No coordination concerns raised	i) Delayed release of planning conditions leading to delays in the contract with the main contractor; ii) S.106 Agreement needs further amendments; iii) Relocation of street furniture required to satisfy planning conditions; iv) late hand-in of documents to finalise the contracts between the client and the main contractor	i) 'Parties named in the original agreement were incorrect' (MM05-W5/18-Case#2); ii) 'discrepancy between the Land Registry drawings and the site boundary on the proposed plans' (MM05-W5/18-Case#2)	No coordination problems reported	i) Changes to materials; ii) location of the gas boiler meant that changes had to be made to the design	i) Major changes to rainwater harvesting system; however, this was primarily due to unexpected ground conditions	i) Delays on site; ii) changes to the materials needed; iii) gas remediation works; iv) local council requested the engineers to stop undertaking gas monitoring when atmospheric pressure is high; v) The client asked the engineers to finalise their proposals urgently (after constant delays); vi) uncertainty over whether BRE would accept design changes due to water table; vii) architect was late with the landscaping scheme and issuing it to the planners

(Continued)

	Wave 11	**Wave 12**	**Wave 13**	**Wave 14**	**Wave 15**	**Wave 16**	**Wave 17**	**Wave 18**
Contr. Homo.	-0.438	-1.032	-1.101	-0.914	-0.432	0.360	0.153	1.077
Contr. Centr.	0.699	-0.938	0.699	0.699	-0.668	-2.027	0.699	-2.027
Org. Exp.	-0.681	0.293	-0.592	-0.093	-1.478	0.404	0.480	-0.997
Coordination Problems	i) Work on site dependent on approval from HA; ii) delayed finalisation of the landscaping scheme; iii) design changes required in some plots; iv) documentation handed in by sub-contractors did not meet the requirements set by the client and their agent	i) Delays caused by the client in obtaining information from the BRE; ii) boundary fence delayed because of late confirmation from the local council; iii) cost overrun; iv) contractual arrangements delayed; iv) late hand-in of documentation by several sub-contractors	i) Cost overrun; ii) traffic management problems; iii) late hand-in of documentation by the piling sub-contractor and the beam and block flooring sub-contractor; iii) delays on site compromised the funding from the HCA	i) Main contractor was late in issuing information to BRE due to delays with the architect's drawings; ii) power on site delayed; iii) sockets had to be removed/replaced; iv) sign-off between the engineers and the planners was delayed	i) Light bracket poorly fitting at front and back (due to miscommunication among suppliers)	i) Uncertainty regarding the method of tree protection (organisations failed to obtain a definitive answer); ii) Anglian Water returned agreement to client for initialling	i) Additional building costs; ii) contractual issues between client and main contractor	i) Bacterial test failed; ii) omissions in the cost breakdown; iii) additional building costs issued by the local council; iv) Fire Brigade officer demanded changes to the PV panel junction box; v) minor faults

(Table continues on next page)

North Wingfield (Case#3)										
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**	**Wave 9**	**Wave 10**
Contr. Homo.	-1.239	0.601	0.995	-1.439	1.108	-0.144	-1.312	-2.554	0.206	-0.394
Contr. Centr.	-1.616	-0.895	0.789	-1.217	0.789	1.991	-0.755	-1.857	-0.414	-0.144
Org. Exp.	2.331	2.331	1.578	-0.779	-0.064	-0.597	-1.155	-0.806	-0.430	-0.358
Coordination Problems	No coordination problems reported	i) Minor issues with paper work	i) Uncertainty about land registry; ii) Misunderstandings about the timetable	i) Issues raised as the main contractor issued several service requests	i) Board approval dependent upon the final costs estimate; ii) back-and-forth decision about technical specifications for the boiler; iii) details regarding the party walls were missing; iv) amendments to the health and safety plan	i) Delays between the client and the local council; ii) minor issues regarding the plan and details on the drawings	i) Main contractor failed to provide site setup to the local council; ii) main contractor is late in providing the cash flow report to the client; minor amendments needed for planning approval; iii) local residents expressed concerns about the noise	i) Failure to agree on the boiler specificities within the time frame agreed	i) BT plc stated that the relocation of a cable was impossible; ii) delays to the revised plan; iii) local authority raised issues about site boundaries	i) Pending issues with EcoHomes prevent a Design Stage application to the BRE; ii) delays in transferring the land ownership from the local authority to the client; iii) pending documentation from sub-contractors

(Continued)

	Wave 11	**Wave 12**	**Wave 13**	**Wave 14**	**Wave 15**	**Wave 16**	**Wave 17**	**Wave 18**	**Wave 19**
Contr. Homo.	0.206	0.493	0.404	0.995	0.897	0.935	0.456	-0.144	-0.068
Contr. Centr.	0.880	0.390	-0.414	0.188	-0.414	0.390	0.616	1.304	0.390
Org. Exp.	-0.555	-0.293	-0.179	-0.304	0.449	-0.275	0.152	-0.597	-0.451
Coordination Problems	i) Delays with soft landscaping proposals; ii) insufficient information regarding CfSH; iii) issue with the Highway Covenant off Chesterfield Road giving an Easement of 10m from the back edge of the path into the site; iv) client, main contractor and engineers ask for intervention of solicitors about the BT cable; v) design had poor 'buildability'; vi) client chaseed solicitors regarding the BT cable; vii) water supplier demanded some alterations to the design;	i) Main contractor failed to progress with the Design Stage Assessment and submission to the BRE; ii) design of a section of the building needed amendments; iii) ongoing issue with BT cable	i) Derbyshire Police had concerns with security of the biomass system; ii) delays in Design Stage Assessment submission	i) Ongoing concerns/ delays over BT cable	i) Information sharing issues were between client, engineers and main contractor over the biomass system; ii) local council demanded more information about the drawings; iii) wood pellets to be used instead of woodchip	i) HA and NEDCC were slow to decide on the bus stop relocation; ii) Post Office was slow to process road naming; Post Office and Building Control had to be chased	i) HA and NEDCC were slow to confirm bus stop relocation, causing delays; ii) delays with the biomass system installation	i) Contractual concerns between the client and Severn Trent; ii) changes had to be made to provide level access shower; iii) minor communication problems	i) Minor misunderstandings between utility firm and client

(Table continues on next page)

Rowlett Road (Case#4)								
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**
Contr. Homo.	-0.979	1.505	-1.227	1.008	0.204	-0.837	-0.316	0.642
Contr. Centr.	0.141	-0.561	-0.561	-0.982	1.542	-0.561	-0.561	1.542
Org. Exp.	-1.320	-1.025	-0.485	-0.534	1.600	0.364	0.776	0.624
Coordination Problems	No coordination problems reported	ii) Local school contested the positioning of site boundary ii) documentation from the main contractor was late	i) Review of mechanical engineering outstanding; ii) county council was late in finalising agreements	i) Sub-contractors late to hand in documentation	i) Delays in finalising parking area and landscaping	i) Consultants were slow to check sustainability credentials for the building	No coordination problems reported	i) Design changes required in order to meet planner's demands - 'the Local Council wanted "contemporary" look to the scheme – use a combination of cladding, metal windows and mono pitch roofs to achieve this' (MM10-Case#4)

Case#5 Blyth Court						
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**
Contr. Homo.	0.300	2.151	0.379	0.455	0.345	0.775
Contr. Centr.	1.085	0.711	-0.035	0.412	1.085	0.711
Org. Exp.	0.845	-0.780	1.713	0.702	0.752	-1.369
Coordination Problems	i) Client's agent noted poor coordination with the engineer; ii) misleading quotation from the contractor based on incorrect assumptions about the work; iii) uncertainty regarding the asbestos	i) Engineer was late with details; ii) soak ways wrongly designed; iii) delayed documentation	i) Alternatives to shower bases needed; ii) waste report failed to meet CfSH requirements; iii) window misspecification regarding SbD	i) Confusion regarding the lift and firing system, between client, architects and engineers; ii) information on radiators delayed by plumber; iii) suggested flush cisterns not maintenance-friendly as requested by the client; iv) planners considered road cleaning to be an issue; v) mechanical and electrical sub-contractors prevented planning discharge	i) Client and main contractor did not meet conditions set out by the local council (Building Regulations application); ii) collateral warranties from sub-contractors outstanding; iii) remedial work on windows insufficient	i) Considerate Constructors score low; ii) 'buildability' issues

(Continued)

	Wave 7	**Wave 8**	**Wave 9**	**Wave 10**	**Wave 11**	**Wave 12**
Contr. Homo.	0.345	-0.641	-1.540	-1.031	-0.593	-0.945
Contr. Centr.	0.412	-0.596	-2.277	-0.596	0.244	-1.157
Org. Exp.	-0.780	-0.011	-1.242	1.105	-0.507	-0.427
Coordination Problems	i) Revised drainage drawings provided, but the levels on the drawings did not work; ii) outstanding collateral warranties from sub-contractors; iii) changes needed to handrails in corridors	i) Drainage and electrical drawings needed revision	i) BRE submission invoice to be paid by the main contractor as per contract and not by the client; ii) fire hose location posts raised maintenance issues	i) BRE took longer than expected to review the application; ii) outstanding collateral warranties from engineer; iii) format for H&S file was not followed	i) Engineer was late in providing lift pit details; ii) ongoing cost issues among contractor, client and client's agent	i) Roof quality was poor; ii) ongoing cost issues among contractors; iii) no safety protection in the access to the lift motor room; iv) light fittings in the bungalows had to be changed to low-energy light fittings, as requested

(Table continues on next page)

Oakely Road (Case#6)								
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**
Contr. Homo.	1.521	-1.109	-1.109	0.471	0.097	0.572	-1.109	0.665
Contr. Centr.	-0.223	0.820	0.142	-1.683	0.142	-0.536	-0.385	1.723
Org. Exp.	-1.652	0.878	-0.820	1.081	-0.761	-0.141	0.878	0.538
Coordination Problems	No coordination problems reported	i) Ownership of the land to be confirmed; ii) drawing needed revision	i) Planning approval with delays; ii) plumbing sub-contractor failed to inform the main contractor about the additional costs for the pipe work; iii) outstanding collateral warranties from sub-contractors, and mechanical and electrical precast floor sub-contractor	i) Outstanding collateral warranties from sub-contractors	i) Site boundary delimitations to be agreed; ii) outstanding collateral warranties from mechanical, electrical, precast and floor sub-contractors	i) Unable to obtain a response from adjoining owner; ii) late BRE certification; iii) outstanding collateral warranties from mechanical, electrical, precast and floor sub-contractors	i) Unable to obtain a response from adjoining owner	i) Minor building quality problems; ii) outstanding documentation from the local council; iii) boiler pipe work had to be relocated due to poor functionality

Washbrook Road (Case#7)										
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**	**Wave 9**	**Wave 10**
Contr. Homo.	0.123	-0.604	-1.069	0.139	-1.778	0.240	0.293	-0.172	1.165	1.663
Contr. Centr.	0.336	0.426	-0.118	-1.824	-1.484	0.074	0.221	-0.118	1.244	1.244
Org. Exp.	-0.202	-0.553	0.591	1.417	1.390	-0.145	-0.119	0.386	-0.962	-1.804
Coordination Problems	i) Late resolution of legal matters prior to starting work on site; ii) windows specifications needed revision; iii) boiler had to be relocated; iv) natural lighting needed in bathrooms; v) main contractor failed to provide cost analysis	i) Pilling queries and pilling logs were not passed on by the contractor; ii) discharge of pre-start condition had to be chased on a weekly basis with the local council; iii) unable to obtain a response from adjoining owner; iii) planners rejected a change from a metal front railing to a timber one	i) Sub-station positioning was considered unacceptable by the planners; iii) outstanding collateral warranties from sub-contractors	i) 'Buildability' issues; ii) outstanding collateral warranties from sub-contractors	i) Outstanding collateral warranties from sub-contractors; ii) Pilling queries and pilling logs were not passed on by the contractor	No coordination problems reported	i) Pipe work contractor failed to justify changes to the initial project	No coordination problems reported	i) 'Buildability' issues	i) Client and main contractor failed to provide necessary information to utility company regarding the sub-station on site

Note: Unstandardised values are presented in **Appendix 4.5**.

Contra. Homo. – Contractual Homophily
Contra. Centr. – Contractual Centrality
Org. Exp. – Organisational Expertise-Driven Homophily

6.3.2. Organisational Expertise-Induced

Organisational expertise-induced discontinuities were found to be mainly caused by an increase in organisational expertise-driven homophily. This insight was gained through a comparative analysis of the variation in organisational expertise-driven homophily and the inventory of coordination problems in every *wave*. Furthermore, coordination problems also came from interactions among organisations with similar organisational expertise, regardless of the existence of ties.

In Washbrook Road (Case#7), coordination problems were observed between *wave 3* and *wave 5*, during which there was substantial organisational expertise-induced homophily (**Table 19**). The positioning of the sub-station on site was considered unacceptable by the planning control officer from the local council. Essentially, the coordination problem came from three organisations: the architect, the engineering firms and the local council, three organisations whose expertise spanned different domains. Due to expertise-driven homophily, these organisations failed to interact properly and communicate regarding the location of the sub-station on site. These examples were typical of the degradation in coordination that took place among various organisations across different domains of organisational expertise throughout the design and build life-cycle.

However, interactions among organisations with similar types of organisational expertise were not free from coordination problems either. This was observed between *wave 3* and *wave 5* in Blyth Court (Case#5), when organisational expertise-induced homophily increased significantly (**Table 19**) alongside coordination problems. Several design changes (e.g. shower bases and windows) were required in order to comply with planning permission, as these aspects had not been properly taken into account by the architects and other design professionals involved in the project. I observed several examples of coordination problems among organisations with similar organisational expertise. Consider the main contractor and some of their sub-contractors, for example. The manager of the plumbers failed to pass on information about the radiators, resulting in delays in carrying out the required tests to the pipe work installed in the building. Additionally, the flush cisterns ordered were not maintenance-friendly. This request had been made by the client's manager to the main contractor's project manager on the site. The M&E sub-contractors

prevented the discharge of planning conditions due to delays on site and a failure to provide required information.

In Fulmar Road (Case#2), uncertainty was created by several episodes of ambiguous information being passed between the client's project manager and their agents, two parties with monitoring responsibilities for the project. In *wave 3*, when organisational expertise-driven homophily increased above the average (1.859), the client's agent sought to confirm the arrangements regarding the tenants with the client's project manager (**Table 19**). This had implications for the instructions that the client's agent would have to give to the organisations starting work on site (e.g. main contractor), as well as other professionals working on the project (e.g. architect). The conflicting information provided caused an issue in terms of coordination and the epicentre was two organisations operating within similar domains of organisational expertise, namely monitoring. Later in the project, the agreement between the client and the water supply company was returned due to incorrect information and procedures (letter from water supply company; MM16-W16/18-Case#2). This took place in *wave 16* when there was an increase in organisational expertise-driven homophily (0.404) that was sustained in the following *wave* (0.480) (**Table 19**). Both managers were surprised by the procedures adopted by the water supply company.

These findings provide a fine-grained explanation of how organisational expertise-driven homophily acts as a mechanism that induces coordination problems. Firstly, organisational expertise-driven homophily in dynamic inter-organisational relationships triggers coordination problems through the absence of inter-organisational ties that jeopardise integration across organisational expertise domains. The absence of ties shows discontinuity in the structure of inter-organisational relationships. Secondly, organisational expertise-driven homophily creates subtle discontinuities in the way inter-organisational relationships operate through the development of common understandings locked in to specific domains of expertise. For instance, monitoring organisations follow procedures and adopt communication practices containing aspects that get 'lost in translation' during communication with other domains of expertise, as illustrated by the example of the agreement returned by the water supply company.

Therefore, the measure of organisational expertise-driven homophily signals an absence of inter-organisational relationships, and indicates that organisations may be

using shared norms and practices that could also trigger coordination problems. The notion of organisational expertise-induced discontinuities captures the richness of homophily as a mechanism of coordination problems.

Both organisational expertise and contractual relationships were found to underlie the development of coordination problems but what happens if contract-induced and organisational expertise-induced discontinuities occur in parallel?

6.3.3. 'Break-Up'

The combination of contract- and organisational expertise-induced discontinuities proved to be associated with coordination problems. Furthermore, it was significantly associated with cases of low overall coordination of dynamic inter-organisational relationships. Accordingly, I argue that such a combination leads to a degradation of the coordination of dynamic inter-organisational relationships, in what can be described as a 'break-up' situation.

In North Wingfield (Case#3), a case of low overall coordination, the fabric of inter-organisational relationships experienced a 'break-up' as the aforementioned combination of discontinuities occurred at numerous stages of the design and build life-cycle. As early as *wave 3*, contractual bottlenecks (contractual homophily, 0.995; contractual centrality, 0.789) and organisational expertise-induced homophily (1.578) were found to have increased significantly above the average for this configuration of inter-organisational relationships (**Table 19**). Thus, organisations that were contractually bound (e.g. the main contractor) were unable to reach non-contracted organisations (e.g. the local council) and neither were inter-organisational ties developed among domains of organisational expertise. I emphasise the early stage because of the transition from the design to the build stage. In this case, the drawings were being finalised by the architect as the main contractor's project managers were preparing to start work on site (e.g. setting up offices, hoarding[89] site boundaries and starting ground work).

Another 'break-up' of the fabric of inter-organisational relationships was found half-way through the design and build life-cycle, as the building's structure (concrete frame, internal and external brick walls) was completed. A turnover of organisations

[89] Hoarding is a temporary wooden fence around a building or structure under construction or repair. There are several specialist hoarding contractors operating in the UK.

occurred as the bricklayers gave way to numerous specialist suppliers starting work on site (e.g. plumbers, M&E sub-contractors and tiling contractors). This occurred between *waves* 11 and 12. Particularly in *wave 11*, my findings show that contractual bottlenecks (contractual homophily, 0.206; contractual centrality, 0.880) and organisational expertise-induced homophily (0.555) were substantially above the average (**Table 19**). Close to project completion (*wave 17*), there was another intensification of three mechanisms of coordination problems simultaneously: contractual homophily (0.456), contractual centrality (0.616) and organisational expertise-driven homophily (0.152). This was at the same time as organisations on site were trying to recover from delays in order to hand the project over to the client by the agreed deadline. In the end, the handover of the North Wingfield (Case#3) was delayed by two weeks at an extra cost of £155, 000[90].

Further supporting evidence of a 'break-up' of the fabric of inter-organisational relationships comes from the Blyth Court (Case#5). The start of the project (*wave 1*) was marked by contractual homophily (0.300), contractual centrality (1.085), and organisational expertise-driven homophily (0.845) (**Table 19**). Coordination between the architect and the client's agents was unsatisfactory. Meanwhile, the main contactor provided misleading quotations for the work to be carried out, based on misunderstandings and incorrect assumptions. Soon after the internal demolitions (e.g. partitions) and removal of existing refurbishments (e.g. joinery and asbestos) were completed, my findings show sustained mechanisms of coordination problems in *wave 5* (contractual homophily, 0.455; contractual centrality, 0.412; organisational expertise-driven homophily, 0.702) and *wave 6* (contractual homophily, 0.345; contractual centrality, 1.085; organisational expertise-driven homophily, 0.752) (**Table 19**). These instances of a 'break-up' in the fabric of inter-organisational relationships occurred in the first half of the project. In the second half (*waves 6-12*), no such instances were found. This aspect was important in the context of the 'case story' of the Blyth Court (Case#5). To recap, several delays occurred at the initial stage coupled with numerous misunderstandings about the nature of the work to be carried out. Eventually, the organisations managed to recover time in the second half of the project. This (Case#5) was delivered 'on time and on budget'. Although there

[90] Based on the overall score of coordination consequences (**Chapter IV**).

were minor coordination problems regarding material specifications, these did not impact negatively on the progress on site.

My analysis showed that a higher number of instances of a combination between contract-induced and organisational expertise-induced discontinuities were associated with cases of low coordination of inter-organisational relationships. Consider the Dale Lane (Case#1). My findings show that in six *waves* (out of twelve) there was a combination of contract-induced (either contractual homophily or contractual centrality) and organisational expertise-induced discontinuities (**Table 19**). There are two important insights to make here. First, 'break-up' discontinuities occurred mostly in the second half of the project. Moreover, these were sustained for over four months (between *wave 8* and *wave 11*). During this period, coordination problems ranged from delayed circulation of the drawings among the relevant parties, missing documentation, and project targets being missed. The handover was delayed by three weeks and the SbD certification was refused due to incorrect material specifications. Despite the organisations having prior experience of working together, this did not result in widespread collaboration. Rather, the organisations related to one another based on contractual relationships and domain of organisational expertise. Second, the figures for the number of combinations of contract-induced and organisational expertise-induced discontinuities were significantly high given the duration of the design and build life-cycle. Six *waves* (out of twelve) of 'break-up' discontinuities represents 50% of the design and build life-cycle.

Moreover, the actual number of combinations of contractual bottlenecks and organisational expertise-driven homophily was higher when compared to other projects where the design and build life-cycle was substantially longer, such as those in Fulmar Road (*18 waves;* Case#2) and North Wingfield (*19 waves*; Case#3). In each of the latter cases, I found only five instances of a combination of contract-induced and organisational expertise-induced discontinuities, which represents 27.77% (five out of eighteen *waves*) for Fulmar Road and 26.32% (five out of nineteen *waves*) for North Wingfield. These figures show a stark contrast with the figure of 50% for Dale Lane (Case#1).

The findings regarding 'break-ups' in the fabric of dynamic inter-organisational relationships and coordination consequences were wholly consistent with the overall coordination of dynamic inter-organisational relationships. Medium overall

coordination in Blyth Court (Case#5) was associated with four instances (*waves* 1, 3, 4 and 5) of 'break-ups' (**Table 19**). In contrast, the Rowlett Road (Case#4) and Washbrook Road (Case#7) projects, where I found a high level of coordination, had fewer 'break-ups' (two and one, respectively). The Oakley Road (Case#6) is an exception as it had three such instances, despite a high level of overall coordination.

To conclude, the theoretical mechanisms of contractual bottlenecks (i.e. contractual homophily and contractual centrality) and organisational expertise-driven homophily were found to be robust predictors of coordination problems on a monthly basis. Moreover, these measures signal the development of discontinuities in the fabric of inter-organisational relationships. These discontinuities unfold at the intersection of the structure and 'content' of inter-organisational relationships and can be of three types: contract-induced, organisational expertise-induced and 'break-up'. These discontinuities are meaningful beyond the presence/absence of ties. Ties – or the absence of ties – are visible in the graphical representations of configurations of dynamic inter-organisational relationships. However, discontinuities are not as they are intrinsic to the tie, being related to, for example, shared norms and understandings between organisations.

Chapter VII: A Theory of Coordination Voids (ToCV)

Overview

In this chapter, I will discuss the findings of my research, and in doing so I will propose an emerging framework based on the observation that the coordination of inter-organisational relationships leads to the development of coordination voids. These are discontinuities in the fabric of inter-organisational relationships, caused by the mechanisms aimed to promote coordination but in fact hampering it. Theorising about this paradox, I will discuss a set of theoretical contributions this research makes to strategic management, and organisational and management theory, as well as its methodological contribution to the organisational research methods literature. I will end my discussion of the contributions of this research by highlighting practical implications for managers and policy-makers. Finally, I will suggest an agenda for further research on the coordination of dynamic inter-organisational relationships.

7. Coordination, Inter-Organisational Relationships and Voids

It is often assumed that coordination problems in inter-organisational relationships occur due to a lack of coordination mechanisms. I will argue that coordination and coordination problems in dynamic inter-organisational relationships are two sides of the same coin. For instance, contracting is often regarded as an aid to coordination; however, it appears that it also undermines coordination.

The tension between these two effects provides me with a starting point from which to theorise on how the coordination of inter-organisational relationships unfolds. I will argue that the mechanisms of coordination and coordination problems need to be understood through a nuanced perspective, which I will articulate in a theory of coordination voids (ToCV). Voids are discontinuities in the fabric of inter-organisational relationships resulting from mechanisms intended to aid coordination, but in fact hampering coordination. In this chapter I will elaborate the ToCV, which provides a parsimonious framework for the coordination of dynamic inter-organisational relationships.

Theoretical contributions to strategic management and organisational and management theory will be put forward alongside methodological contributions. Based on my empirical study, I will draw implications for managers and policy-makers, in terms of an opportunity to deliver more for less in inter-organisational arrangements. Last but not least, I will set a research agenda aimed at advancing our understanding of 'what is seen, but not yet visible' regarding the coordination of dynamic inter-organisational relationships.

7.1. Summary of the Findings

The fundamental premise about coordination is that one organisation's possibilities for action are shaped by other organisations as they become mutually dependent on each other's resources (Gulati & Gargiulo, 1999; Thompson, 1967). Thus, the alignment of actions and resources among organisations is critical for understanding the consequences of inter-organisational relationships. Interestingly, there is scant prior research on (1) how inter-organisational relationships are coordinated over time and (2) why coordination problems occur. My motivation behind my research was to address these two shortcomings.

The coordination of inter-organisational relationships is a key area of interest across many industries. In particular, the UK's building industry, one of the largest in the UK by GDP, turned out to be an appropriate research setting to explore the theoretical foundations of the topic. I saw an opportunity to apply my research to an industry that has been wrestling with dysfunctional collaborations among organisations and increasing building costs. This is occurring hand-in-hand with the UK Government's efforts to tackle England's social housing shortage. As of 2012, there were 1.84 million people in England waiting for social housing, and almost five million in the UK as a whole[91]. Another relevant aspect is the current debate about climate change and how the building industry is addressing this challenge.

Against this backdrop, and in line with my research interests, I conducted a multiple case study of seven dynamic inter-organisational relationships (Eisenhardt, 1989). I examined newly built social housing projects completed between 2008 and 2011 in the East Midlands region of England. Drawing on over 3,900 pages of data, I developed an in-depth approach to the study of inter-organisational relationships that integrates inductive research (Glasser & Strauss, 1967) and SNA techniques (Wasserman & Faust, 1994). I was able to map the inter-organisational relationships on a monthly basis and explore the richness of the data through content analysis to unlock the underlying mechanisms of their coordination.

My first research question was the following: *How are dynamic inter-organisational relationships coordinated?* Unexpectedly, I found that the traditional mechanisms of coordination – contracting and the use of monitoring organisations – proved to have no association with the consequences of coordination (van de Ven & Gordon, 1984; Williamson, 1996). This was shown consistently across the seven case studies. Instead, I discovered that coordination stems from two theoretical mechanisms, which I termed 'organising' and 'relating'. The former describes how the use of contracting leads to hierarchy, while the latter denotes the association between the use of monitoring organisations and the density of inter-organisational relationships. Furthermore, the sequence in which these coordination mechanisms are used explains the cross-case differences in the consequences of coordination. Therefore, I argued that dynamic inter-organisational relationships are coordinated through the juggling of coordination mechanisms.

[91] *U.K. Pushes 'Social' Housing REIT Plan* by Anita Likus. Wall Street Journal, Wednesday, May 9, 2012.

The second research question was the following: *Why do coordination problems occur in dynamic inter-organisational relationships?* My analysis showed that coordination problems develop unseen from traditional mechanisms of coordination such as contracting. Drawing on a combination of inductive research and SNA techniques, I showed that coordination problems arise due to two theoretical mechanisms: contractual bottlenecks (i.e. contractual homophily and contractual centrality) and organisational expertise-driven homophily. My analysis showed that these two mechanisms foster discontinuities in the fabric of inter-organisational relationships, and the discontinuities proved to be robust predictors of the coordination problems that occurred each month across the seven cases.

In summary, my findings identified that coordination hinges on the relationship between administrative mechanisms (i.e. contracting and monitoring organisations) and the structure of inter-organisational relationships. A closer inspection also revealed a point of tension: the same mechanisms aimed at achieving coordination are simultaneously found to explain the manifestation of coordination problems.

7.2. An Emerging Theory of Coordination Voids (ToCV)

A view has emerged of the coordination of inter-organisational relationships that builds on my empirical study. I now advance my Theory of Coordination Voids (ToCV) to stitch together my analytical blocks and explain the paradox I found in terms of mechanisms that are traditionally associated with coordination proving to simultaneously *cause* coordination problems. I will begin the development of this ToCV by establishing a vocabulary. Then, I will present the theoretical underpinnings and the consequences of coordination voids.

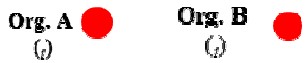
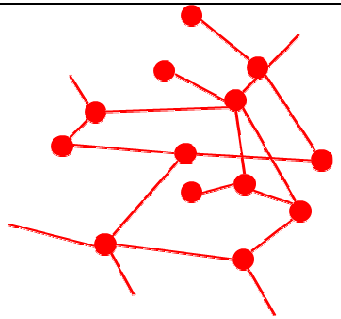
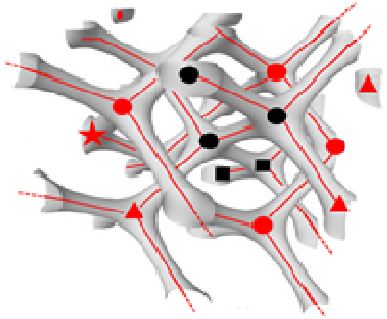
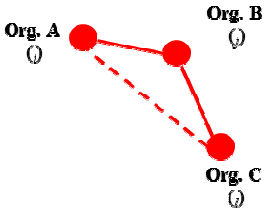
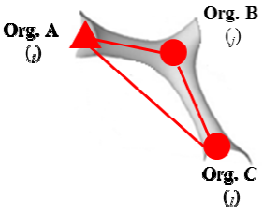
New vocabulary is required to better convey my findings. Naturally, my point of departure is prior social network research applied to the study of inter-organisational relationships. At this stage, I want to recap some fundamental notions that are used in the current research (**Table 20**). Organisations – for instance, Organisation A ($_i$) and Organisation B ($_j$) – are called nodes. An interaction between these two organisations is known as a tie (x_{ij}). For example, Organisation A ($_i$) establishes contact with Organisation B ($_j$) to design a new social housing project. Clearly, more organisations than this will be required to complete the project. More importantly, organisations establish multiple interactions throughout the design and build life-

cycle. This forms a configuration of inter-organisational relationships ($\sum\{x_{ij}\}$) which is dynamic insofar as inter-organisational ties are created and ended over time. The representation of inter-organisational relationships captures these nodes, ties and configurations. Ties are depicted as lines connecting dots that represent organisations (**Table 20**). This captures the conventional view in a nutshell.

My research has unveiled a new perspective that expands the conventional one by complementing the SNA with qualitative aspects (**Table 20**). My framework is stitched together with the threads of an emerging vocabulary. From a coordination viewpoint, nodes are more than just the names of organisations plotted in a visual representation. There is a need for an understanding of the characteristics of these organisations. For instance, the primary domain of organisational expertise of each organisation shapes the alignment of their actions and resources. The first substantial difference in vocabulary is the use of (dis)continuity to refer to what is conventionally known as a 'tie'. In an oversimplified view, a tie is a line linking organisations (i.e. nodes), while a (dis)continuity may include a tie but is not limited to this. Continuity and discontinuity are defined in terms of the presence or absence of coordination-enhancing aspects of the tie – such as trust among the parties or shared norms and values. Therefore, continuity implies the presence of a tie, together with coordination-enhancing aspects. A discontinuity is where the tie exists without such aspects, or of course where there is no tie.

By the same token, a configuration of inter-organisational relationships is formed by organisations (and their characteristics) and ties among those organisations (and coordination-enhancing aspects of those ties). In other words, a configuration of inter-organisational relationships is formed by organisations and continuities, as well as discontinuities. These aspects form what I label the 'fabric' of inter-organisational relationships (**Table 20**). This vocabulary is critical for capturing how the coordination of dynamic inter-organisational relationships unfolds. Moreover, I feel that the notion of a social fabric leaves me better-equipped to tackle the tension between coordination mechanisms (e.g. contracting) and coordination problems (e.g. contractual bottlenecks).

Table 20 An Emerging Framework of the Coordination of Dynamic Inter-Organisational Relationships

Conventional View (Prior research)		**Emerging View** (This study)	
Notion	**Stylised Representations**	**Notion**	**Stylised Representations**
Nodes ($_i$ and $_j$)		**Organisations** ($_i$ and $_j$)	
Ties (x_{ij})		**Continuity** (x_{ij})	
		Discontinuity (x_{ij})	
Configuration ($\sum\{x_{ij}\}$)		**Fabric of inter-organisational relationships** ($\sum\{x_{ij}\}$) (Language, cross-understandings and characteristics of organisations)	 Source: Adapted from Zumer et al. (2010)
Structural Holes (Absence of ties)		**Coordination Voids** (A tie may exist)	

The theoretical underpinnings of my thesis hinge on a tension between mechanisms of coordination (e.g. contracting) and coordination problems. I argue that they are two sides of the same coin, that is, the coordination of inter-organisational relationships. As Simmel (1955, p. 605) notes: 'cooperation and antagonism have a common origin'. Coordination unfolds within a rich fabric of inter-organisational relationships formed by inter-organisational ties but also by relational aspects such as trust and shared norms and values. Furthermore, coordination is a relational phenomenon 'that is situated not only physically in locality, but also mentally in an identity' (Kogut & Zander, 1996, p. 502). These relational aspects are captured in my notion of (dis)continuities in the fabric of inter-organisational relationships.

One important insight on which my research sheds light is the role of (dis)continuities in 'dictating' whether it is coordination or coordination problems that unfold in dynamic inter-organisational relationships. In order to gain a deeper understanding of these (dis)continuities, I believe it is helpful to build on the notion of structural holes. As shown in **Table 20**, a structural hole occurs in a situation where Organisation A ($_i$) interacts with Organisation B ($_j$), and Organisation C ($_l$) interacts with Organisation B ($_j$), but Organisations A ($_i$) and C ($_j$) have no interaction. Organisation B ($_j$) is an intermediary between Organisations A ($_i$) and C ($_j$). Coordination-enhancing aspects are not considered in the notion of structural holes (because it relies solely on measures of nodes and ties in the structure of inter-organisational relationships). Although ties might exist (or be created) for coordination, they are not sufficient for the coordination of dynamic inter-organisational relationships; coordination-enhancing mechanisms are also required.

To overcome this shortcoming in the prior research, I put forward the notion of coordination voids, which builds on the notion of structural holes. While a structural hole is defined by the presence/absence of ties, a coordination void includes not only the absence of ties but also the presence/absence of coordination-enhancing aspects (**Table 20)**. A coordination void emerges from discontinuities in the fabric of inter-organisational relationships. I borrow the notion of a 'void' to capture the tension that underlies the coordination of dynamic inter-organisational relationships. I find the notion remarkably suitable for capturing this tension from a theoretical perspective.

However, the notion of a ‘void’ might prompt different ideas for different people. Thus I will now offer some background to my thinking. I start by considering cosmology. In this, voids are empty spaces between large structures of the universe (i.e. filaments), which have no galaxies (see, Clifton & Ferreira, 2009; Freedman & Kaufmann III, 2008). Here, voids refer to the absence of material, which is nevertheless relevant to understanding the universe and galaxies. In the empirical context of my study, building engineering relies on the absence of material as a building technique. A typical example is the tunnel: ‘a unique type of structure, a significant void distinguished by the absence of material rather than a construct of form (Jackson, 1988, p. 604).

In the social sciences, the notion of a void is found in the field of institutional theory, where ‘institutional voids’ refer to ‘missing institutions that normally underpin the efficient functioning of product, capital, and labor market’ (Khanna & Rivkin, 2001, pp. 46/7). Institutional voids are regarded as the primary explanation for the formation and operation of business groups – corporate agglomerates of several companies – in developing economies. Thus, research deploys the notion of institutional voids to mean ‘analytical spaces’ of contradiction and conflict (Mair, Marti, & Ventresca, 2012).

In organisational everyday life, individuals might experience rational voids, which can be defined as the ‘existence of beliefs which can be considered as justified de facto, and are never discussed because they are taken for granted’ (Gomez & Jones, 2000, p. 698). Rather than a language of absence, rational voids refer to the *existence* of beliefs about the procedures and norms of organisations. Beliefs are fundamental in handling uncertainty, allowing individuals to perform these tasks without question (Akerlof, 1970; Schelling, 1960).

Social network research also employs the notion of the void in the background, as shown in the longstanding debate about closure and brokerage (Burt, 1992; Coleman, 1988; Granovetter, 1973; Obstfeld, 2005; Uzzi, 1997). On the one hand, densely connected inter-organisational relationships breed trust and normative control, which enhances coordination activities (Coleman, 1988). On the other hand, sparse configurations allow individuals and organisations to benefit from access to novel information (Burt, 1992). Recently, Vedres and Stark (2010) addressed this debate with research that built upon what the authors called ‘structural voids’, that is, the

role of presence *versus* the absence of ties. In their study of inter-personal relationships among Hungarian firms between 1987 and 2001, the authors (2010, p. 1183) place importance on the 'missing spaces in the social structure' for the emerging entrepreneurial activity of recombination. Two insights emerge about voids:

(*i*) Voids are spaces, either in structure or meaning.

(*ii*) The consequences of voids are relative – *it depends!*

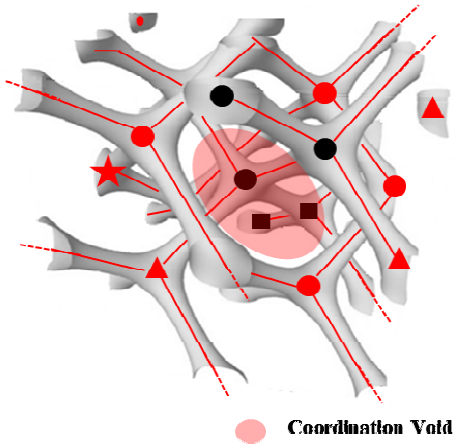
Drawing on these two insights, I define coordination voids as **discontinuities in the fabric of inter-organisational relationships resulting from mechanisms intended to aid coordination, but in fact hampering coordination under certain conditions.**

The conceptual backbone of these discontinuities is the interplay between administrative mechanisms of coordination and the structure of inter-organisational relationships over time. In **Figure 15**, I present a stylised representation of a coordination void, alongside the indicators that signal discontinuities in the social fabric of inter-organisational relationships. Broadly, I use the term 'coordination void' in relation to analytical spaces (Mair et al., 2012). Coordination voids occur when discontinuities create spaces that are empty of the ties or 'meanings' required to coordinate inter-organisational relationships. Although ties might exist, relational aspects – such as differences in terms of expertise, incentives to coordinate and cross-understandings – are absent.

Coordination voids lead directly to the manifestation of coordination problems. Under conditions of contractual bottlenecks, the omission and incompatibility of activities is expected. Although contracts are thought to align organisations, these devices of control foster goal congruence, which in turn results in the control of information among organisations based on their contractual relationships. A coordination void emerges when organisations, regardless of the contractual arrangements, fail to exchange the required information swiftly enough, even when ties exist between the organisations. Prior research also alludes to 'strategic gambling' and misinformation as outcomes of contractual arrangements (Grandori, 1997b; Macaulay, 1963). Furthermore, the effects of contractual arrangements extend beyond the parties involved as these devices shape the structure of the entire

configuration of inter-organisational relationships. The consequences of coordination voids are also apparent in the coordination problems that stem from organisational expertise-driven discontinuities. Similarity of organisational expertise enhances coordination (Bechky, 2006; Kogut & Zander, 1996). However, although ties between organisations with similar organisational expertise enhance coordination, ties across domains of expertise are also required due to the importance of combining expertise from various domains. A typical case is the installation of 'green' building technology where, as well as coordination among building sub-contractors, interaction with engineers and architects is also crucial to developing an integrated approach. Layout features need to be designed appropriately and building techniques may need to be adjusted. Failure to do so could result in remedial work or faults.

Figure 15 Coordination Voids

Stylised Representation	Indicators
	**Contractual Centrality** **Contractual Homophily** **Organisational Expertise-Driven Homophily** (These three indicators signal the development of coordination problems)

Indirect consequences of coordination voids for coordination include extra costs for organisations – broadly referred to as 'coordination costs' (Coase, 1937; Gulati & Singh, 1998; Williamson, 1979). Current reasoning suggests that coordination costs (e.g. contracts) are necessary to align organisations. Although that reasoning is instructive, coordination voids add a more nuanced view, according to which the use of contracting leads to coordination problems through contractual bottlenecks. These problems add extra costs or delays to the project. Additional contracting is costly and might not result in additional coordination. (I shall explore this further when discussing the practical implications later in this chapter.)

In sum, the ToCV provides the vocabulary and theoretical underpinnings of coordination voids, which is essential to the articulation of my nuanced view on the coordination of inter-organisational relationships.

7.3. Theoretical Contributions

My study contributes with an empirically informed framework of the coordination of dynamic inter-organisational relationships, namely the ToCV. This framework hinges on my observation that administrative coordination mechanisms shape the structure of inter-organisational relationships. My discussion of the contributions of this study will centre around an integration of the SNA with the relevant aspects of my theoretical framework. In so doing, I address the challenge set by Emirbayer and Jeff (1994, p. 1421): 'despite its growing prominence, however, network analysis has yet to be subjected to a theoretically informed assessment and critique…there has been an unfortunate lack of interest in situating network analysis within the broader traditions of sociological theory'[92].

I will now present my specific theoretical contributions to the literature on strategic management and organisational and management theory. Based on my in-depth approach to social networks, I will also specify my methodological contributions to the literature on organisational and research methods.

7.3.1. Strategic Management – Coordination

My research contributes to the debate on the coordination of inter-organisational relationships. Specifically, I contribute to five areas within the coordination literature: coordination problems; the evolution of coordination over time; contracts and trust; strategic motivations (**Table 21**).

(i) **Coordination problems** emerge from discontinuities in the fabric of inter-organisational relationships. Furthermore, I develop the notion of coordination voids, which captures the phenomenon by which mechanisms aimed at fostering coordination can in fact hamper it.

Prior research alludes to coordination problems (Heath & Staudenmayer, 2000; Podolny & Page, 1998; Srikanth & Puranam, 2010); however, it is limited to

[92] Nearly two decades of research later, this is still the case, as shown in recent literature reviews (Borgatti & Halgin, 2011; Kilduff & Brass, 2010; Zaheer, Gözübüyük, & Milanov, 2010).

providing anecdotal evidence (Heath & Staudenmayer, 2000). I contribute to this debate by conceptualising coordination problems in inter-organisational relationships. Specifically, I identify that coordination problems entail three dimensions: (1) omissions of actions and resources, (2) incompatibility of actions and (3) untimely alignment. The final of these emerges from my longitudinal analysis of project reports and the minutes of meetings and provides a nuanced view on the debate regarding coordination problems. Prior research does allude to omissions and incompatibility of actions (Heath & Staudenmayer, 2000). However, by adding untimely alignment, I demonstrate that the timing of interactions is also relevant for explaining coordination problems.

My contribution extends to establishing the theoretical mechanisms of coordination problems: contractual bottlenecks and organisational expertise-driven homophily. The former mechanism entails (1) contractual homophily – organisations' tendency to relate better to other parties with similar contractual ties to the project – and (2) contractual centrality – organisations that are contractually bound to the project are also located in central positions in the project's configuration of inter-organisational relationships. Organisations' similarity in terms of their domains of expertise also enhances coordination; however, it also appears to be associated with coordination problems. Therefore, this study contributes to the enduring call for research into 'problems' with inter-organisational arrangements (Katila et al., 2008; Podolny & Page, 1998) by unravelling the theoretical mechanisms of coordination problems. It is important to understand these aspects of inter-organisational arrangements, where the failure rates are remarkably high (Kale & Singh, 2009; Park & Ungdon, 2001; Podolny & Page, 1998).

(ii) **Over time, coordination** develops in a non-linear trajectory (**Table 21**). Prior research on the coordination of inter-organisational relationships builds on the assumption that coordination follows a linear trajectory, as demonstrated by administrative mechanisms of coordination (Coase, 1937; Ghoshal & Moran, 1996; Williamson, 1996). Contracts are regarded as the primary way to align organisations towards a common purpose, while creating safeguards against opportunistic behaviour (Stinchcombe, 1985a; Williamson, 1996). The contents of the contracts are made up of obligations and expectations aimed at fostering goal congruence among – but mostly between pairs of – organisations (Bradach & Eccles, 1989;

Stinchcombe, 1985a). However, contracts are static mechanisms of coordination insofar as their contents cannot be changed half-way through the inter-organisational venture (Grandori, 1997b; Puranam et al., 2006). This embodies the static perspective on coordination.

This study expands the static view of coordination by showing that the juggling of the 'organising' and 'relating' mechanisms proved to explain the coordination of inter-organisational relationships. Against conventional wisdom, I found that the use of contracts and monitoring organisations was in itself unrelated to the consequences of coordination. Instead, my findings suggest that successful inter-organisational coordination is explained by a time-informed use of contracting.

For example, heavy contracting in Dale Lane (Case#1) contrasted with a delayed handover and the main contractor's failure to fulfil their obligations. Although the client set out in their contract with the main contractor that the new social housing development had to achieve SbD certification, the latter organisation failed to accomplish this. Communication and interaction between the client's agent, the main contractor and the local police was reportedly hampered.

(iii) **Contracting** is thought to operate at the local level – e.g. between organisations – and does not bind an entire configuration of inter-organisational relationships (Grandori, 1997b; Macaulay, 1963). Nonetheless, I argue that it does shape the *structure* of the entire configuration.

A focus on dyads prevails within the contracting literature (Ariño & Torre, 1998; Malhotra & Lumineau, 2011). For instance, the literature on alliances focuses on contractual aspects between pairs of organisations (Casciaro, 2003; Gulati, 1995a; Malhotra & Lumineau, 2011; Puranam et al., 2006). My research shows that contracting has to be analysed from the perspective of complete configurations of inter-organisational relationships. Contracting induces dynamics in the inter-organisational relationships that reach beyond the organisations directly involved in each particular contract. Specifically, contracting shapes how organisations in contractual relationships relate to other organisations with whom they have non-contractual relationships. Contractual homophily occurs because organisations tend to relate better to other organisations with similar contractual ties to the project. To this extent, contracting undermines the relational elements of coordination. Looking at the mechanisms of organising, the use of contracting induces a hierarchy of inter-

organisational relationships. Taken altogether, this contributes to the emerging strand of research that looks at the heterogeneity of contractual arrangements in collaborations (Gulati et al., 2012a).

(iv) **Contracts and trust** are the basis of a longstanding – and indeed unresolved – debate on whether trust is a complement to or a substitute for contracts in aligning organisations (**Table 21**). This is shown in recent research (MacDuffie, 2011; Malhotra & Lumineau, 2011; McEvily, 2011; Poppo & Zenger, 2002), nearly half a century after the start of this debate (Bradach & Eccles, 1989; Macaulay, 1963; Williamson, 1975). Since its inception, several threads of discussion have taken place. Some research suggests that contracts are essential for preventing opportunism and misalignment across organisations – thus contracts are a necessary cost of transacting across organisational boundaries (Coase, 1937; Williamson, 1981). According to this view, trust has no place because it increases the friction among the parties to the transaction. In contrast, others argue that contracts undermine trust among the parties involved (Ghoshal & Moran, 1996; Zajac & Olsen, 1993).

At first glance, my study supports the view that contracts are critical for aligning inter-organisational relationships. Contracting is used as a strategy to allocate – or distribute – risk among organisations. For instance, across all seven projects of social housing, the client opted for a JCT Design and Build contractor in a deliberate attempt to allocate all risk to the main contractor. Through the use of a *lump sum* contract, any extra costs incurred during the building project (e.g. due to geological conditions or technical complexity) are absorbed by the main contractor. No substantial evidence was found in this study for a direct effect of contracts on trust. Notwithstanding this, contracting shapes the configuration of dynamic inter-organisational relationships and hierarchical structures breed ties that are less based on trust (Kenis & Knoke, 2002).

In a related discussion, prior research suggests that experience of working together, in other words familiarity, enhances trust among organisations (Gulati, 1995a; Gulati & Sytch, 2008). In this regard, trust that stems from previous experience substitutes for contracts. I found that previous experience of working together was important in the phase of mobilising/recruiting organisations. Organisations tend to bring in third parties with whom they have worked before. Recently, familiarity was questioned as an explanation to the formation of ties on the

grounds that the antecedent of familiarity is the success of previous ventures (Sytch & Gulati, 2012). The findings of my research adhere to this perspective. For instance, the client's choice of quantity surveyor to evaluate the plot of land and respective building project in Oakley Road (Case#6) was based on previous (positive) experience. This shows that previous inter-organisational ties breed trust because only successful ventures lead to continued ties (Sytch & Gulati, 2012).

(v) **Strategic motivations** also shape the alignment of organisations (**Table 21**). Managers interact with counterparties through multiple strategic commitments. Multi-party arrangements operate on the basis of complementarity of resources (and motivations) (Pfeffer & Salancik, 1978; Provan & Milward, 1995; van de Ven & Gordon, 1984). For instance, developers (main contractors with design expertise) seek out local housing associations, driven by the prospect of future business. Housing associations are interested in buying plots of land that already have planning permission and approved drawings. Housing associations also collaborate with government agencies to access financial resources for new developments.

The delivery of a new development requires interactions among multiple parties with diverse strategic commitments. Local councils are important organisations in these collaborations as the UK's legal framework endorses them to oversee the planning regulations. I observed that, often, the main contractors and the architects were reluctant to communicate with local councils. The architects were more concerned with the design, and the main contractor with completing the project 'on time and on budget'. Often, different sub-groups co-exist within the same multi-party arrangement, for example, contractors and sub-contractors, and the client and the local council. Hence, multi-party arrangements are required to coordinate parties with diverse, as well as similar, motivations so that they can achieve their common goal (Provan & Milward, 1995; van de Ven & Gordon, 1984). My study shows that, although strategic motivations are important for aligning organisations, coordination is better understood as similar and divergent strategic motivations occurring within the same arrangement, requiring the inputs of all organisations to be aligned.

Overall, my study contributes to the coordination strand within the strategic management literature. The specific contributions include coordination problems, coordination over time, contracting, contracts and trust, and strategic motivations.

Table 21 Theoretical Contributions

1. Domain	2. Key Debates	3. Current Theoretical Reasoning	4. Contributions of this Study
Strategic Management	(i) Coordination problems (ii) Coordination over time (iii) Contracting (iv) Contracts and trust (v) Strategic motivations	(i) Although widely acknowledged, research on coordination problems remains limited (Katila et al., 2008) (ii) Much of prior research suggest that coordination develops linearly over time (Williamson, 1996) (iii) Contracting is understood to occur between organisations (Coase, 1937; Williamson, 1996) as there is limited research on coordination at the network level (Gulati, et. al., 2012b). (iv) Debate over whether trust is complementary to or a substitute for contracting (Malhotra & Lumineau, 2011; Poppo & Zenger, 2002; Ring & van de Ven, 1994) (v) Multi-party arrangements operate on the basis of complementarity (and motivations) (Casciaro & Piskorski, 2005; Pfeffer & Salancik, 1978)	(i) Coordination problems stem from two mechanisms: contractual bottlenecks and organisational expertise-driven homophily. (ii) Coordination unfolds in a non-linear fashion and requires the juggling of mechanisms (organising and relating) over time (iii) Contracts extend beyond the particular dyad concerned by creating bottlenecks (iv) Strategic motivations enhance coordination; however, coordination in multi-party arrangements is better understood as similar and divergent motivation co-existing.
Organisational and Management Theory	(i) Dynamics of inter-organisational relationships (ii) Sparse versus cohesive configurations (iii) Heterogeneity (iv) Task complexity	(i) Dynamic inter-organisational relationships have received little attention in empirical studies (Ahuja, et al. 2012; Borgatti & Halgin, 2011); specifically, in terms of the processes (Bizzi & Langley, 2012). (ii) While cohesive configurations enhance coordination (Coleman, 1988; Granovetter, 1973), sparse configurations provide organisations with novel information (Burt, 1992). However, this remains an inconclusive debate (Gulati, et al., 2011). (iii) Heterogeneity of configurations presents hazards; yet it has gains for organisations (e.g. learning) (Goerzen & Beamish, 2005; Ring & van de Ven, 1992) (iv) Task complexity leads to coordination problems (Argote, 1982; Casciaro, 2003)	(i) Drawing on extensive analysis, this study shows the dynamics of inter-organisational relationships are interwoven with the use of contracting and organisational expertise. (ii) I show that hierarchical (sparse) configurations stem from contracting and sparse configurations result from the actions (e.g. liaison roles) of monitoring organisations. I bring together dense and cohesive aspects. (iii) Heterogeneity is a necessary, but not sufficient, condition for organisations to coordinate I add monitoring organisations as a vehicle for resource bundling. (iv) Coordination problems result from relational aspects and less so from task complexity.

7.3.1. Organisation and Management Theory – Dynamic inter-organisational networks

I have developed an empirically-informed framework based on the notion of coordination voids – discontinuities in the fabric of inter-organisational relationships resulting from mechanisms intended to aid coordination, but in fact hampering coordination under certain conditions. I now present contributions that span dynamics of inter-organisational relationships, the sparse 'versus' cohesive debate, the heterogeneity of organisations and task complexity.

(i) **Dynamic inter-organisational relationships** are pivotal for the theorising within the fast-growing social networks literature. The ToCV provides several empirical insights relevant to the current theorising (**Table 21**). Specifically, I found that the interplay between action and structure is a critical component of the micro-foundations of dynamic inter-organisational relationships.

Prior research suggests that 'economic action and consequences, as any social action and consequences, are affected by actors' dyadic relations and by the structure of the overall network of relations' (Granovetter, 1992, p. 32). This study contributes towards the understanding of the micro-foundations of dynamic inter-organisational relationships by unravelling the tension between coordination-targeted actions and coordination problems, that is coordination voids.

My study into the mechanisms of coordination problems provides several insights into the 'genesis' of dynamic inter-organisational relationships (Ahuja et al., 2012; Provan et al., 2007). I relied on month-by-month analysis over an average of 14 months, which adds greater granularity to the measure of time (prior research mostly uses years). Drawing on the combination of inductive research and SNA techniques, I discovered that contractual arrangements shape the dynamics of inter-organisational relationships. Contractual bottlenecks concern two processes: contractual homophily and contractual centrality. The former shows that organisations tend to form ties based on contractual arrangements, while the latter conveys the observation that organisations centrally placed in the configuration of inter-organisational relationships also tend to be engaged in contractual arrangements. Altogether, the mechanism of contractual bottlenecks adds a nuanced view whereby contractual arrangements are interwoven with the structure of ties among organisations.

Furthermore, I provide empirical indicants that capture this mechanism empirically and will enable other researchers to implement it.

Organisational expertise proved to influence the formation of ties among organisations. My findings show that organisations tend to form ties with parties of similar organisational expertise. This integrates the literatures on the role of organisational expertise in coordination (Bechky, 2006; Kogut & Zander, 1996; Srikanth & Puranam, 2010) and on the SNA (Davis & Eisenhardt, 2011; Galaskiewicz, 1985; Gulati & Gargiulo, 1999).

Altogether, this study highlights the role of contracting and organisational expertise in the dynamics of inter-organisational relationships.

(ii) **Sparse 'versus' cohesive** is a debate that resonates with my findings on the two mechanisms of coordination, organising and relating (**Table 21**). Dense configurations breed trust and norms of control among the ties, which is ideal for coordination (Coleman, 1988; Granovetter, 1973). In contrast, a sparse configuration provides organisations with more novel information (Burt, 1992).

My study shows that the type of organisations involved in configurations of inter-organisational relationships influence how they function. Specifically, monitoring organisations operate as third-party intermediaries and remove discontinuities by incentivising the development of ties across domains of organisational expertise. These organisations also foster cross-understandings and mutually agreed norms through a liaison role, which lead to cohesive configurations of inter-organisational relationships. My research contributes to the debate on sparse 'versus' cohesive networks by showing that, rather than cohesiveness being shaped by monitoring organisations, it is instead a discrete property that unfolds naturally (Coleman, 1994; Mariotti & Delbridge, 2012; Uzzi, 1997). I also add the role of monitoring organisations as another dimension of managerial intervention in inter-organisational relationships (Maurer & Ebers, 2006).

Based on the mechanism of organising, I showed that contractual arrangements lead to hierarchical configurations. This extends prior theorising on hierarchy in inter-organisational relationships by showing contractual arrangements to be an antecedent (Kenis & Knoke, 2002; Stinchcombe, 1985a). Hierarchical structures suggest that organisations are dependent on a few organisations to communicate across the configuration of inter-organisational relationships. Arguably, hierarchical properties resemble the features of sparse configurations (Krackhardt, 1994).

Therefore, this provides further insights into the explanatory mechanisms that underlie the development of sparse configurations.

Last but not least, my study brings together evidence that both sparse and cohesive configurations of inter-organisational relationships are the result of an interplay with the administrative mechanisms of coordination (i.e. the use of contracts and monitoring organisations). This blends the structural with the sociological view of inter-organisational relationships (Burt, 1992; Coleman, 1994; Granovetter, 1985; Podolny & Page, 1998). The juggling of coordination mechanisms shows that the consequences stemming from sparse or cohesive structures change over time instead of being a constant outcome. This is shown by the sequence of mechanisms of organising and relating that proved to explain the cross-case differences in the consequences of coordination. Organising mechanisms are linked with hierarchical structures, relating mechanisms with sparse configurations.

(iii) **Heterogeneity** of organisations requires coordination across domains of organisational expertise (**Table 21**). Some researchers suggest that organisations with little in common are unlikely to seek interaction, which hinders communication (Kogut & Zander, 1996; Puranam et al., 2006; van de Ven & Gordon, 1984). However, heterogeneity provides gains for organisations, such as learning (Goerzen & Beamish, 2005; Ring & van de Ven, 1992).

My findings suggest that the coordination of inter-organisational relationships mediates the benefits obtained from a large pool of expertise. I argue that the availability of resources is a necessary but not a sufficient condition for organisations to coordinate. Managerial action is required in order for resource bundling to be observed (Lavie, 2006; Sirmon, Hitt, & Ireland, 2007). To this literature, I add the role third parties (i.e. monitoring organisations) play in the process of resource bundling.

(iv) **Task complexity** refers to the number of components that each task entails. Although the projects analysed in this study are arguably of a small scale[93] by industry standards, an average of 40 organisations took part in each design and build life-cycle. This number illustrates the increasing division of labour among organisations across many industries, with the building industry no exception. Prior

[93] Average cost £1,849,481; average number of organisations involved 40; average completion time fifteen months.

research posits that task complexity increases the likelihood of coordination problems among organisations insofar as it becomes a source of uncertainty (Argote, 1982; Ring & van de Ven, 1992). In this study, it was reasonable to expect that coordination problems would occur in particular phases of the design and build life-cycle, based on the assumption that each stage entails different levels of task uncertainty and degrees of uncertainty (Hillebrandt, 1984; Latham, 1994). Instead, I observed that coordination problems occurred across the design and build life-cycle in a seemingly random fashion.

Where task complexity and uncertainty are perceived as high, organisations are more like to invest in the coordination of inter-organisational relationships (Bensaou & Anderson, 1999; Casciaro, 2003). In social housing projects, one way of investing in coordination is to hire monitoring organisations; this was particularly evident when new technologies were brought in. An illustrative case is the design and implementation of the biomass system in North Wingfield (Case#3). Specialist consultants were brought in as the client's agent and the main contractor anticipated some uncertainty in this aspect of the project. The design and fitting of a biomass system is a complex task because it requires several sub-tasks to be performed across organisational boundaries. This shows that task complexity does not have to lead to coordination problems, even in the case of the world's last large handcrafted product, buildings.

In this section, I have presented the overarching contribution of this study, based on the ToCV, which sheds light on coordination voids, that is, discontinuities in the fabric of inter-organisational relationships resulting from mechanisms intended to aid coordination, but in fact hampering coordination. My theorising on this point of tension makes specific theoretical contributions to strategic management and organisational and management theory.

7.4. Methodological Contribution

One of the advantages of my methodology was the integration of inductive research with the SNA. This allowed me to draw on the extensiveness and richness of over 3,900 pages of data sources and to deepen our understanding of the

theoretical mechanisms of coordination and coordination problems in dynamic inter-organisational relationships (**Table 22**).

7.4.1. Organisational Research Methods – Social networks research

My methodological contribution to organisational research methods is anchored in the development of an in-depth approach to studying inter-organisational relationships. In particular, I show that this approach contributes to social network research across two dimensions: method (integration of methodologies and data sources) and network characteristics (dynamic networks and complete networks).

The integration of methodologies contributes to the development of an in-depth approach to the study of inter-organisational relationships, which blends inductive research (Eisenhardt, 1989; Glaser & Strauss, 1967) and SNA (Galaskiewicz, 1985; Wasserman & Faust, 1994). The integration of inductive research and SNA techniques provides, I argue, a valid approach for addressing the longstanding call for the joint study of the mechanisms and the structure of inter-organisational networks (Ahuja et al., 2012; Sydow & Windeler, 1998).

Inter-organisational relationships are formed by nodes ($_i$ and $_j$) that are connected by ties (x_{ij}), and can be represented graphically in a configuration ($\sum\{x_{ij}\}$) (Wasserman & Faust, 1994). Much of network research builds on large datasets (Gulati & Gargiulo, 1999; Walker et al., 1997), relying exclusively on SNA measures to map inter-organisational relationships. An exception is Gulati and Singh's (1998) study of the mode of coordination in alliances, combining (predominantly) SNA and interviews with managers. Still, quantitative-based approaches prevail in the study of inter-organisational relationships, as documented in recent literature reviews (Borgatti & Halgin, 2011; Brass et al., 2004; Kilduff & Brass, 2010; Provan et al., 2007; Zaheer et al., 2010).

The overarching insight across these reviews is the call for in-depth research on the mechanisms underlying inter-organisational relationships (Ahuja et al., 2012; Provan et al., 2007). To some extent, this is currently being addressed by an increasing cohort of scholars conducting qualitative research (Davis & Eisenhardt, 2011; Hardy et al., 2003; Mariotti & Delbridge, 2012; Maurer & Ebers, 2006; Uzzi, 1997). Their research builds on the richness of the qualitative analysis of inter-organisational relationships. Of course, the decision to use SNA is strictly informed

by the researcher's interests. Nevertheless, qualitative analyses often constrain the possibility of comparing and integrating research across strands (**Table 22**).

I address the apparent dichotomy between quantitative and qualitative by building on the conceptual framework of Carley and Palmquist (1991) to develop a stepwise approach for extracting social network data from text. I manually extracted inter-organisational network data from over 1,700 pages of meeting minutes in a very time-consuming process marked by numerous 'backs' and 'forths', which took me nearly a year to refine and complete. I report this process thoroughly here and I believe this could ease future implementations of this in-depth approach. Every step is described, including the hazards, solutions and reliability tests. This will allow interested scholars to implement this approach within their own domains of research.

The data sources used in my approach enrich the spectrum of data sources previously used to gather data on social networks. Currently, self-reported data (e.g. questionnaires) and secondary data (e.g. datasets) are the dominant ones.

Datasets are widely used in studying inter-organisational arrangements such as alliances (Baum et al., 2000; Polidoro et al., 2011) and consortia (McEvily & Zaheer, 1999; Soda & Usai, 1999). In a recent review of research on (complete) inter-organisational relationships, Provan et al. (2007, p. 511) establish that: '[a]lthough there is hardly any serious alternative to these quantitative methods [standardised questionnaires and SNA] for studying large-scale networks, additional insights into the structure and content of the relationships, their development over time, the initial conditions at founding, and changing contexts could be gained by the additional use of qualitative methodologies such as narrative interviews and participant observation' (**Table 22**).

One of the advantages of text-based data is the possibility of articulating the insights of the SNA with a fine-grained understanding of the unfolding mechanisms depicted in (monthly) accounts of the collaboration among the organisations. To the best of my knowledge, the use of the minutes of meetings to conduct SNA of inter-organisational relationships, in a field that is already very eclectic in terms of research methods (Ibarra, Kilduff, & Tsai, 2005), remains a novel approach. I showed that there is much to gain from the ongoing research in sociology (Gibson, 2005) and strategy practice (Dittrich et al., 2011) by using meeting minutes.

Table 22 Methodological Contributions

1. Dimensions	2. Current Research		3. Contributions Made by this Study
	Aspects	**Current practice**	
Method (SNA)	Integration of Methodologies	(i) Networks are often studied using datasets (Gulati & Gargiulo, 1999; Walker et al., 1997), relying exclusively on SNA metrics (see Gulati & Singh, 1998, for an exception). (ii) Qualitative studies do not used SNA metrics (Davis & Eisenhardt, 2011; Hardy et al., 2003; Mariotti & Delbridge, 2012; Maurer & Ebers, 2006; Uzzi, 1997).	(i) Integration of inductive research and SNA (ii) Use of text to extract SNA data (Carley & Palmquist, 1991). Stepwise approach to the combination of text-based data and the SNA. This approach can be replicated by researchers since all steps and reliability tests are reported.
	Data Sources	(i) Self-reported data (e.g. questionnaires) (ii) Secondary data (e.g. datasets)	(i) Minutes of meetings enrich the spectrum of data sources in an already eclectic field. Furthermore, they provide a fruitful data source through which to explore the richness of the phenomena underlying networks.
Network Characteristics	Dynamic (Longitudinal) Networks	(i) Current research is still dominated by one-time observations (Borgatti & Halgin, 2011; Kilduff & Brass, 2010; Zaheer et al., 2010). (ii) Recent research on longitudinal networks is often limited in terms of the number of observation points. The unit of time is often one year.	(i) Dynamic configurations of inter-organisational relationships (ii) Monthly-observed configurations of inter-organisational relationships with multiple observation points; n = [8;19].
	Complete Networks	(i) Ego networks prevail in prior research and emphasis is given to dyads (Gulati, 1995a; Larson, 1992) and triads (Greve et al., 2010; Tortoriello & Krackhardt, 2010).	(i) This study contributes with an analysis of seven complete configurations of inter-organisational relationships.

Longitudinal networks research has attracted an increasing number of scholars interested in dynamic configurations of inter-organisational relationships (**Table 22**). However, current research is still dominated by one-time observation; this is shown in recent specialised literature reviews by Borgatti and Halgin (2011), Kilduff and Brass (2010) and Zaheer et al. (2010). My study provides a longitudinal investigation of seven configurations of inter-organisational relationships in social housing projects. Recent research on longitudinal networks is often restricted to the use of years as the unit of time (Ahuja, 2000a). However, inter-organisational relationships often unfold as a process of incremental change, going back and forth (Ring & van de Ven, 1994). For instance, Vedres and Stark (2010) report that inter-personal relationships among Hungarian firms between 1987 and 2001 were marked by overlaps in their structures, with ties changing constantly. I contribute to this topic with a month-by-month analysis of the configurations of inter-organisational relationships in my seven cases. My study thereby adds greater granularity in terms of the unit of time used (a month), with the total number of observation points per case ranging from 8 to 19 months. This contributes to emerging approaches to study processes in social networks (Bizzi, & Langley, 2012)

Complete networks are still scarce in a field of research dominated by research on ego networks (**Table 22**). Emphasis is given to dyads (Gulati, 1995a) and triads (Greve et al., 2010). However, understanding inter-organisational relationships often requires data on the ties among all organisations (i.e. the complete network). Collaborative arrangements targeting the development of a new technology are a typical example in which it is critical to have the benefit of mapping the complete network (Davis & Eisenhardt, 2011). However, as far as research on complete networks is concerned, 'there is simply not very much of it' (Provan et al., 2007, p. 510). This study contributes with an analysis of seven complete configurations of inter-organisational relationships in the context of social housing projects.

In sum, my development of an in-depth approach to the study of inter-organisational relationships expands the literature on organisational and research methods. Specifically, my contribution spans across two dimensions: method and network characteristics. This adds to the current literature and, when integrated with the relevant theoretical frameworks, will allow researchers to explore further the theoretical mechanisms that underlie inter-organisational relationships.

7.5. Practical Implications

In what follows, I will discuss the practical implications of my research. This study engaged with two main areas relevant for managers and policy-makers: England' social housing shortage and tackling environmentally sustainable construction. Reflecting on the practical implications has been expressed as follows: 'the intelligent application of the experiences of the past to the expectations of the future' (Stinchcombe, 1985a, p. 172). True to this, and based on my empirical study, in the following subsections I shall note numerous practical implications that point towards ways of delivering more for less in inter-organisational arrangements.

7.5.1. Managerial

This study has numerous managerial implications for the coordination of inter-organisational relationships in the building industry, a collaboration-averse context. Specifically, I draw implications for managers addressing the long-lasting low effectiveness of such relationships, and reflect on some managerial innovations that might help to tackle this challenge. A debate on managerial change is particularly important given that the building industry, one of the largest in the UK by GDP, has a poor track record of effectiveness and innovation compared to other industries.

Effectiveness is a fundamental concern in the context of the UK's building industry, where projects are typically over-budget and delayed. My study contributes towards a fine-grained understanding of the issues of effectiveness.

The dimension of 'on time and on budget', which is part of my multi-dimensional indicator of the consequences of coordination, captures the issues of effectiveness. Drawing on my findings, I argue that the juggling of the coordination mechanisms of organising and relating reduces the likelihood of additional building costs (for contractors and clients). Currently, lower costs are sought through the integration of the design and building stages. This aims to prevent design misspecifications (which are costly). For instance, in Blyth Court (Case#5), the lighting had to be replaced in order to comply with the CfSH. There was also no safety protection in the access to the lift motor room, despite several attempts to redesign the light features. Beyond the integration of stages, my analysis shows that one of the advantages of juggling coordination mechanisms is the development of cost-saving strategies throughout the design and build life-cycle (**Table 23**).

Alongside making cost savings, the coordination of inter-organisational relationships leverages the potential for time-recovery strategies. Delays can occur in obtaining planning permits and getting supplies on site. This study provides insights on the 'causes' of delays. According to prior research (Hillebrandt, 1984; Smyth & Pryke, 2008) and trade reports (Latham, 1994), delays on site occur due to unforeseen factors, such as weather and geological conditions. My analysis confirms that delays can be caused by these factors; however, in some cases organisations recovered from these delays. Therefore, the core question is whether adequate coordination of inter-organisational relationships is in place.

I have thus shed light on how the combination of current practices (e.g. the integration of building and design stages) and new approaches, such as the juggling of organising and relating, can enhance effectiveness.

Social innovation, in this discussion, refers to innovative managerial processes aimed at fostering coordination among organisations, and delivery in collaborative arrangements. Below, I discuss how new ways of organising inter-organisational relationships can enhance, for example, the delivery of 'greener' buildings.

The main focus in innovation has been on the technical aspects, and this is reflected in accounts that show that the building industry is low in terms of innovativeness (Winch, 2003). Although, this perspective is instructive, broadening the scope of innovation is also important. Taking a step back, my research shows that the underlying role of social innovation is the delivery of technical innovation, such as environmentally sustainable technology (**Table 23**).

First, I argue for the rethinking of contracting practices among organisations. These practices have routinely been considered from a dyadic perspective; however, managers should also consider how the effects of contracts extend across the entire configuration of inter-organisational relationships (e.g. through contractual bottlenecks). The failure to do so might result in a dysfunctional approach, and this needs to change given the current vogue for inter-organisational collaboration arrangements (Sytch & Gulati, 2012; Zaheer et al., 2010).

Second, and related to the abovementioned managerial implications, the presence of monitoring organisations is not a sufficient condition for delivering projects effectively; they must be hired at the right times. The conventional wisdom suggests that monitoring organisations are the key to a project running smoothly and can help

to shelter the client from risks. Although this study supports such a view, this should not overshadow the insight that the impact of monitoring organisations varies over the course of a project. Indeed, some have pointed out that employing too many monitoring organisations can result in a 'confusion of consultants' (Latham, 1994).

Third, coordination among organisations enhances the delivery of the technical solutions required for greener buildings. This is a key challenge for managers as the UK Government has set environmental sustainability standards for new buildings that has often been addressed through in-built technology. However, my study shows several examples where this strategy was not a straightforward success. In North Wingfield (Case#3), the design and installation of a biomass system involved several coordination problems and additional work. This case clearly illustrates that the introduction of technical innovation[94] may well be an important part of attaining a project goal, but its success will ultimately rest on the organisations' ability to coordinate. My view is that managers need to calibrate the appointment of the main contractors (and their sub-contractors) according to their ability to deliver the project specifications. This will also foster ties among suppliers, which in turn will contribute to foster innovation in low-technology settings, of which the building industry is an example (Cox, Frenz, & Prevezer, 2002a).

Last but not least, my study unveils some managerial implications in terms of the design of inter-organisational relationships. The relevance of design in terms of informing management has attracted the interest of some scholars (Estrin & Barzelay, 2011; van Aken, 2004). Design science 'is not concerned with action itself, but with knowledge to be used in designing solutions, to be followed by design-based action' (van Aken, 2004, p. 226). In what has been mostly an intellectual debate, I argue that some interventions in the design of inter-organisational relationships could prevent the development of coordination voids. For instance, monitoring organisations (e.g. client) need to be involved in the appointment of the main contractor (as currently does), but their role should extend to the appointment of sub-contractors (move downstream in the supply chain).

In sum, the managerial implications of my study are related to effectiveness and social innovation in managerial practices relationships.

[94] I focus on the adoption of technical innovations because many of these innovations are developed in other industries (e.g. steel) and then applied to the building industry. The challenge, therefore, is to make the necessary adjustments in terms of building techniques and managerial practices.

Table 23 Managerial and Policy-Making Implications

1. Domain	2. Key Areas	3. Current Challenges/Proposed Directions	4. Implications of this Study
Managerial	(i) Efficiency (ii) Social innovation	(i) Building 'on time and on budget' (ii) 'Confusion of consultants' (iii) Low innovation, mostly technical (social has been less studied)	(i) Contracting is not sufficient for the coordination of inter-organisational relationships; an analysis of the impacts of contracting on the extended configuration of inter-organisational relationships is required. (ii) The timing of the use of monitoring organisations matters. (iii) Technical innovation requires innovations in managerial practices. (iv) Greater integration downwards between the client's agents and the sub-contractors would minimise 'voids'.
Policy-Making	(i) Social housing shortage (ii) Environmental sustainability (iii) Infrastructure programmes	(i) Scarce financial resources and increasing building costs. (ii) As one the largest industries, the building industry is required to deliver more environmentally sustainable buildings. (iii) Delivery of infrastructure programmes to boost ailing economies and bring development.	(i) Building costs can be reduced based on collaboration between government-led organisations and contractors. (ii) The adoption of environmental sustainability policies for new buildings requires alignment with management at the project level. Top-down policies are likely to fail because of industry-rooted practices. (iii) Coordination between contractors and local council would reduce building costs and increase the 'usefulness' of the projects for communities.

7.5.2. Policy-Making

My study informs policy-making in two areas: England's social housing shortage and tackling environmentally sustainable construction. The former remains an issue despite the UK Government's programmes of social housing (Hills, 2007). The latter reflects a wider consciousness about climate change and environmental sustainability at the corporate, governmental and societal levels (Ansari et al., 2011; Stern, 2006).

England's shortage of social housing remains a challenge for policy-makers, as shown in the medium-term strategy for housing (to 2015)[95]. Recent events, such as the 2009 financial crisis, have taken a toll, and led to a squeeze on public spending and families' budgets (Scanlon et al., 2011). On the one hand, the figures for people on waiting lists for social housing are increasing. On the other, the UK Government's allocation of financial resources is affected by cuts in public spending coupled with increasing building costs. I will focus on the latter factor since the former is inflexible at present. Policy-makers are required 'to do more with less' (**Table 23**).

Policy-makers contract for the lowest bid (I acknowledge there are tending arrangements that give more weight to technical quality in the final decision) according to design briefs that stress the affordability of the material and building process. These results of my study lead me to cast some doubts about the value of this approach and suggest some policy implications. Quite simply, the lowest building costs do not necessarily come with the lowest bid. Low building costs stem from the coordination of inter-organisational relationships throughout the design and build life-cycle. Although all seven cases I studied were contracted based on providing the lowest bids, three out of seven went over budget (Cases #2, #3 and #6). Furthermore, coordination among organisations provided the basis for value-engineering solutions that enabled them to offset extra costs if they emerged. I argue that public tending policies should include incentives to foster coordination among organisations as a strategy for reducing building costs (and preventing over-budget costs). One strategy would be to enhance the participation between government-led organisations (e.g. local councils and local police) and the project team on site. As things currently stand, *ad hoc* mechanisms of coordination mostly involve the contractors and the client's agents. Indeed, if building costs are to be reduced, further

[95] *Laying the Foundations: A housing strategy for England* (2011). London: H. M. Government.

attention needs to be paid to coordination of among organisations. This is a fairly interesting proposition that could help to expand social housing supply while maintaining the current level of public spending.

Another domain of policy implications relates to expanding the delivery of environmentally sustainable construction. Framed in the broader debate of climate change and environmental sustainability (Ansari et al., 2011; Stern, 2006), the UK Government's strategy of low-carbon construction[96], and its funding criteria, work primarily according to a top-down approach. Taking the specific example of social housing, the Government requires buildings to have environmental sustainability as a condition for funding (**Table 23**).

Thought should to be given to the next stage, however: implementation at the project level. A great deal of the success of these policies lies in the coordination of dynamic inter-organisational relationships and the mechanisms that transform policies into action. My study shows that the successful adoption of environmental sustainability-targeted construction technology in new projects often depends on inter-organisational dynamics, from the pre-start phase to the completion of the projects. The current practice of hiring environmental sustainability consultants is the first step in bringing in specialised expertise. Consultants minimise the discontinuities among organisations (contractors, engineers and architects). The transition from policy-making to implementation requires, however, further coordination strategies to aid the organisations engaged in the projects.

Clients demand certain environmental sustainability standards (e.g. 'Level 4' of the CfSH), which the architects meet by bringing in new technology. Tighter coordination among the architect, the main contractor and their suppliers, and the local council is critical. Coordination would lead to the development of joint solutions (instead of industry-rooted practices) that could deliver high environmental sustainability standards that are less technology-dependent. This is aligned with my other policy implications targeted at reducing building costs so as 'to do more for less'. All considered, policy-makers need to be imaginative in their strategies so as to deliver greener buildings and keep costs under control. Contrary to the common thinking, my study shows that environmentally sustainable building has to be neither expensive nor complex. Mostly, it requires coordination among organisations

[96] *Low Carbon Construction Innovation & Growth Team*. London: H M Government (2010).

working across domains of organisational expertise. This is acknowledged among practitioners to some extent. The delivery of London Olympics 2012 shows that the building industry can deliver 'on time and on budget'.

My last policy-making implication cuts across both issues, developing social housing and promoting greener buildings. A further understanding of the coordination of inter-organisational relationships is critical as we are referring to one of the largest sectors of the UK's economy, and investment in public infrastructure is being sought by the Government as a strategy to support an ailing economy. According to the 2011 Autumn Statement, the UK Government has targeted the building industry with a multi-billion infrastructure investment plan aimed at fostering economic growth[97]. By the same token, the governments of developing countries and international funding agencies (e.g. EBRD, the European Bank for Reconstruction and Development) are also targeting the building industry as a way to boost economic growth and development. Major investment programmes in roads and public buildings (e.g. hospitals), but also nationwide programmes involving small-scale projects (e.g. water pumps), are part of this strategy (**Table 23**).

However, the success of any policy-making endeavour aimed at boosting development and economic growth through infrastructure is linked to the micro-foundations of the dynamic inter-organisational relationships involved in delivering the projects. It should come as no surprise that neglecting the coordination of inter-organisational relationships might harm the success of such investment strategies. It is therefore important to be able to deliver more infrastructure for less. This is surely no less important when the management of resources is needed to take people at the 'bottom of the pyramid' out of poverty (Ansari, Munir, & Gregg, 2012). In this context, a key aspect of the success of the interventions is to identify the set of infrastructure needed by communities at the local level. Strategies for coordination among organisations and local representatives can bridge the gap.

Overall, the managerial and policy-making implications of my study break away from the conventional view that coordination problems are addressed through 'more coordination'. My overarching point is that it is possible 'to do more for less', *less* being contractual arrangements or technological innovation and *more* being more savings on building costs or greater environmental sustainability standards.

[97] *2011 Autumn Statement*, London: H. M. Treasury.

7.6. Argument Transferability: Public *versus* private projects and cost-driven *versus* innovation-centric projects

My research opens up possibilities for transferring the argument on coordination and coordination voids to nuanced contexts. In particular, it matters to discuss the transferability of my argument from public to private projects, as well as from cost-driven projects to innovation-centric projects.

My study draws on a set of seven projects of social housing that have been publically-funded to address the shortcoming of social housing in several towns in East Midlands. Accountability is fundamental such that local housing associations need to justify the value of these investments. Although cost and time overruns in publically-funded projects are widely known to the public, private projects can equally experience such underperformance. I would argue that knowing more about public projects than private projects results from the exercise of accountability in public projects rather than a reflection of fundamental differences between public and private projects. A private developer or a household is also interested in attaining value for money in their projects. From a coordination perspective, client's agents are employed to control the cost and oversee the design and build life cycle. The appointment of client's agent is often the case in private clients, more so, if the client has little experience in contracting (e.g. households). Another aspect of similarity between public and private project relates to the supply-chain; many suppliers and contractors are engaged in both types of projects simultaneously. This is observed for small-scale projects, as those I base my study upon. For similar projects (in terms of size and technical complexity), the arguments developed in this should hold in understanding how coordination and coordination problems unfold among organizations working together in private projects.

Innovation-centric projects posit another interesting area of transferability for my argument, specifically in terms of coordination problems. I have no evidence to suggest that coordination problems stem from tight budget. Rather, I find that coordination problems stem from the interplay between mechanisms aimed to aid coordination which lead to discontinuities in the social fabric. This is an important insight for innovation-centric collaborations. For instance, R&D collaborations often underperform in terms of innovation out despite substantial financial investment and commitment from the partners. As coordination among partners is critical, the

deployment of coordination mechanisms can be seen as an appealing solution. However, such a solution has two drawbacks. First, it increases the coordination costs without a necessary improvement of coordination (as suggested in prior literature). Second, the deployment of coordination mechanisms is less suitable for collaborations whereby partners combine resources and look for new solutions which require flexibility (as opposed to planned coordination). Based on this study, I also argue that coordination voids can also develop in innovation-centric projects. The implications are coordination problems, as well as financial costs associated with implementation and low return on the financial investment by partners.

Overall, I see potential for transferability of my argument to other contexts – such as, private projects and innovation-centric projects. This should not discourage a careful analysis of the context, though.

7.7. Limitations and Further Research

My research does not come without limitations. One is the limited diversity of contracting arrangements within each case. This study focuses on JCT Design and Build contracts. The strategy of categorising contractual relationship as 'contract' and 'non-contract' was appropriate for this study because it captured the key features of contracting, which are very similar across projects (due to standardisation). The contents of the contracts are an essential part of the collaborative dynamics of inter-organisational relationships (Faems, et. al., 2008). Recent research has called for a fine-grained understanding of the contents of contracts (Lumineau & Quélin, 2012). This study suggests that contracts shape inter-organisational relationships. However, do the contents of the contracts shape the effects of inter-organisational relationships? Are effective contracts at the dyad level also effective at the inter-organisational level?

This research is also under a specific economic outlook: the financial crisis of 2009 unfolded as I started my field work. The economic downturn hit the UK's building industry severely and this needs to be taken into account when reading my findings. In the 1980s, when reporting on the findings of his research among builders in Boston, Eccles (1981, p. 347) warned of the need for 'caution on reading the findings because this study was conducted in a State with a severely depressed housing industry at the time of these interviews'. I too conducted my research in a

depressed industry. According to the figures for construction output, the volume of new construction orders in 2011 dropped 14.1% from 2010[98]. Nonetheless, my study has contributed to management research with insights from a deprived and low-innovation sector of activity.

From a methodological viewpoint, the use of the minutes of meeting was fruitful for studying the coordination of dynamic inter-organisational relationships. Still, meeting minutes have limitations, as do any other data source. The contents of the minutes were represented narratives of the projects. Prior research draws attention to the bias and partial information in other written data sources (e.g. transcripts) (Bauer & Gaskell, 2000). However, the use of multiple case studies in this research was advantageous in helping to reduce such biases. In extracting social network data from text-based data sources, I painstakingly built on the framework of Carley and Palmquist (1991) in order to develop an in-depth approach to social networks. I reported my approach and reliability tests in great detail so that other researchers will be able to use them in their research endeavours.

I used an inclusive definition of coordination that was suitable for my study of inter-organisational relationships (Grandori, 1997b; van de Ven & Gordon, 1984). In further research, though, a fine-grained operationalisation of coordination will be desired. Through my interviews with practitioners, I learnt that coordination is a rich phenomenon. One suggestion for further research would be to investigate inter-organisational relationships according to Thompson's types of coordination (1967): *sequential*, *reciprocal* and *pooled*. How do *sequential*, *reciprocal* and *pooled* coordination unfold within dynamic inter-organisational relationships over time?

Some of the directions for further research are part of my research agenda, which is grounded by this study. I am interested in the notion of 'social fabric' as opposed to 'configurations', as a concept that conveys the richness of the coordination of inter-organisational relationships. I am currently working towards a fine-grained theorising *On the nature of coordination in dynamic inter-organisational relationships* (**Appendix 5.1**).

I am also interested in risk management and the evolution of the structure of inter-organisational relationships. On the one hand, the structure of inter-organisational relationships influences the perceived risk. Dense configurations are perceived as

[98] *Output in the Construction Industry (2010).* London: Office for National Statistics (2011).

less risker, where risk is seen as the likelihood of collaboration by other organisational – that is, relational risk (Nooteboom, et. al., 1997). On the other hand, managers actively manage risk in inter-organisational collaborations and that affects ties among organisations. For instance, this study shows that monitoring organisations shape the configuration of inter-organisational relationships. Therefore, I am pursuing further insights at the intersection between these two elements: *Trust and risk in dynamic inter-organisational* (**Appendix 5.1**). The extensive research on the risk management has not been integrated with the social network approach. I think that research in this area is much needed.

In my view, conceptual refinement co-occurs with methodological rigour and sophistication. I have demonstrated the relevance of the use of text-based data for studying social networks (Gibson, 2005). With hindsight, I recognise that I underestimated the resources required for the development of an in-depth approach for my study of the coordination of inter-organisational relationships. I too underestimated the amount of personal learning I would have to do as a result of following a 'trial and error' approach. I trust that I have gone a long way towards shortcutting the implementation of this approach in further research. In the interest of replicating this approach, I shall share it with the community of researchers – *An in-depth approach to social network analysis: relevance, methods and applications* (**Appendix 5.1**). There is enormous potential for the use of text-based sources of network data. Considering the difficulty of accessing longitudinal social network data, minutes published by publicly managed organisations provide a pool of data. For instance, UNICEF (The United Nations Children's Fund) provides public access to the minutes of their meetings regarding projects that entail inter-organisational relationships in developing economies. Moreover, an in-depth approach to social networks provides potential to move social network research forward in an area where meaningful analyses are scarce (see, Bizzi & Langley, 2012).

As for further extensions in terms of the empirical setting, a suitable one could be related to the fast-growing literature on social enterprise. For instance, the coordination of inter-organisational relationships is relevant to aid organisations (Hardy et al., 2003), which rely on collaboration with a wide array of organisations and contractual arrangements in order to reach their target populations. Another extension would be to organisations that provide network relations for others, known

as ‘waving organisations’ (Ingram & Torfason, 2010).The mission of these organisations is to create ties among organisations. The Bill & Melinda Gates Foundation, for example, ‘fund, monitor, and direct meta-organisations of non-profit agencies, connecting them with each other and with crucial political, social and economic actors’ (Gulati et al., 2012a, p. 575). However, the question is how are these organisations bound together? Are the actions of ‘waving organisations’ sufficient to produce the positive consequences?

Conclusion

In this study, I have examined coordination and coordination problems in dynamic inter-organisational relationships. My findings shed light on the interplay between administrative coordination mechanisms and the structure of inter-organisational relationships. I have shown how the solution is also part of the problem in the coordination of inter-organisational relationship. On the one hand, coordination hinges on the mechanisms of organising (the use of contracting that leads to hierarchy) and relating (the use of monitoring organisations that leads to density). On the other hand, mechanisms intended to promote coordination undermine coordination by creating discontinuities in the social fabric of inter-organisational relationships. I have theorised on this point of tension based on the notion of coordination voids, leading to my development of a ToCV. My study provides theoretical contributions and insights for innovation of managerial practices.

Coordination has attracted the interest of scholars across various fields of the social sciences, such as economics (Coase, 1937; Williamson, 1981), organisation studies (Grandori, 1997b) and strategy (Ring & van de Ven, 1992). The research domain of inter-organisational relationships is no exception; the alignment of actions and resources across organisations is part of an organisation's everyday life (Gulati & Gargiulo, 1999). Contracts between organisations are regarded as the primary mechanism for aligning organisations transacting in the marketplace (Coase, 1937). Contractual relationships reduce the 'frictions' that underlie relationships among organisations, while creating safeguards against other parties' opportunistic behaviour (Williamson, 1979).

Meanwhile, organisations become increasingly embedded in configurations of inter-organisational ties so as to access resources that are available elsewhere and which they depend upon (Pfeffer & Salancik, 1978). Thus, the relational aspects of networks expand the set of alternative coordination mechanisms that underlie inter-organisational relationships (Bradach & Eccles, 1989; Macaulay, 1963; Powell, 1990). Furthermore, less costly mechanisms are required to access these resources and foster organisations' competitiveness (Barney & Hansen, 1994). This signals a change towards the relational aspects of inter-organisational relationships such as trust-based ties and familiarity (Gulati, 1995a; Nooteboom et al., 1997), the structure

of inter-organisational relationships (Ahuja, 2000a) and attributes of arm's-length (contractual) and embedded (trust-based) ties (Uzzi, 1997).

Inter-organisational relationships are attractive for researchers and practitioners alike. Such ties trigger knowledge transfer (Owen-Smith & Powell, 2004) and learning (Doz, 1996), which leverage innovation outcomes (Obstfeld, 2005) and organisations' operations (Sorenson & Stuart, 2001). Surprisingly, there has been little research on how organisations align their resources and actions. This spectacular limitation is emphasised by the lack of research on coordination problems (Heath & Staudenmayer, 2000), which leaves us with a one-sided story.

Prior literature has been slow to address successive calls based on literature reviews for more longitudinal research in the area of inter-organisational relationships (Ahuja et al., 2012; Borgatti & Halgin, 2011). At the same time, many researchers have turned to theory-building approaches in order to unravel the underlying mechanisms of aspects such as dynamic inter-organisational relationships (Davis & Eisenhardt, 2011; Maurer & Ebers, 2006). My study contributes to this expanding research strand by examining how coordination and coordination problems unfold in dynamic inter-organisational relationships.

I investigated these questions based on a multiple-case study of seven social housing projects in England. Drawing on a unique integration of inductive research and SNA techniques, using over 3,900 pages of project documentation, my findings contribute towards a nuanced view of the coordination of inter-organisational relationships. My study has theoretical contributions to: coordination of inter-organisational relationships, micro-foundations of dynamic inter-organisational relationships and research methods (social networks methods).

I will start with the theoretical contributions directly related to the focus of my study: coordination. I addressed the long-standing call for research on coordination (Grandori, 1997a; van de Ven & Gordon, 1984). The need for a greater understanding of the coordination of inter-organisational relationships was recently noted by Gulati et al. (2012, p. 532): 'scholars have paid less attention to the critical role of coordination'. Strategic management research on the coordination of inter-organisational relationships suggests that contracting is critical to securing coordination. Although I found some support for this view, my findings highlight the interplay between contracting and the structure of inter-organisational networks. I

have provided an inter-organisational network perspective, complementing the dyadic (i.e. pairs of organisations) view that dominates the TCA. In this regard, my study expands our current understanding of the mechanisms used to trigger the coordination of inter-organisational networks but it also contributes towards untangling some of the empirical puzzles in prior research. For instance, this study moved the debate on whether contracts and trust are substitutes or complements for one another into the background. I argued that contracts and inter-organisational networks are intertwined.

An alternative view is to discuss the effects of the interplay between contracting and inter-organisational networks – in other words to move away from the dyadic perspective (where the substitute *versus* complement debate is entrenched). This is directly connected to the longitudinal perspective I have taken in this study. Coordination of inter-organisational relationships requires a combination of mechanisms over time. The typical sequence is one of relating, organising and then relating again (i.e. the project is first driven by relational aspects, followed by contracting, and finally the development of relational assets among organisations). This longitudinal perspective contributes a new view to the current debate on the factors that underlie the high failure rates (up to 70%) of joint ventures and alliances (Kale & Singh, 2009). Prior research focused on the alignment of contractual incentives (Ariño & Torre, 1998) and relationships aspects, such as trust (Gulati, 1995a). Can these high failure rates result from the use of a limited combination of different coordination mechanisms during the ventures?

The second contribution this study makes is to the fast-growing body of research on the micro-foundations of dynamic inter-organisational networks (Davis & Eisenhardt, 2011; Mariotti & Delbridge, 2012). This literature has developed primarily within the field of organisation and management theory. One insight regarding the dynamics of inter-organisational networks is the importance of organisations' characteristics. A critical example is the role of monitoring organisations, that is organisations performing managerial roles only (as opposed to other organisations such as the main contractors and the architect). I found a positive association between the proportion of monitoring organisations among those involved in a project, and the density of the inter-organisational networks.

I suggest that the dynamics of inter-organisational relationships are formed by the fabric of inter-organisational relationships. This notion emerges from the findings that suggest that inter-organisational networks are more than a set of ties and nodes. Furthermore, the structures of inter-organisational relationships (formed by nodes and ties) are insufficient to explain their dynamics. Consider coordination problems. These result from discontinuities in the social fabric of inter-organisational relationships, which in turn stem from the interplay between inter-organisational networks and mechanisms aimed at fostering coordination. This explains how mechanisms of coordination problems, such as contractual bottlenecks, emerge.

The final set of contributions relates to organisational and research methods, specifically, in the domain of social networks. I conducted a fine-grained analysis of dynamic inter-organisational networks through the integration of inductive research (Eisenhardt, 1989) with the SNA (Wasserman & Faust, 1994). I studied seven configurations of inter-organisational relationships on a monthly basis for over 15 months (on average), using SNA metrics and content analysis hand-in-hand. I demonstrated the potential of using text-based data for studying inter-organisational relationships (e.g. minutes from meetings). Furthermore, I provided a detailed account of the steps (and common hazards, according to my experience) of this in-depth approach to studying social networks. I hope that this will lead to a growing body of research aimed at theory building involving inter-organisational networks.

The industrial context of this study had the merit of bringing the building industry back into management research. Since the seminal works of Eccles (1982) and Stinchcombe (1985), the building industry has received little attention (in comparison to biotechnology and telecommunications). I 'bring the building industry back in' by conducting this piece of engaged research (van de Ven, 2007). There are 1.84 million people waiting for social housing in England and almost 5 million in the UK as a whole according to recent figures[99]. At the same time, there is increasing pressure to deliver environmentally sustainable construction. In-built environmental sustainability is paramount if the 2050 target of an 80% reduction in housing carbon emissions is to be achieved in the UK[100]. This will require coordination among organisations working throughout the design and build life-cycle, so that new

[99] *U.K. Pushes 'Social' Housing REIT Plan* by Anita Likus, Wall Street Journal, May 9, 2012.
[100] *Low Carbon Construction Innovation & Growth Team*. H M Government, London, 2010.

materials and building solutions can be identified and implemented. Recent developments in the global economy have redirected attention to the building industry. Multi-million investment packages funded by tax-payers' money are being invested in infrastructure programmes in the UK. This policy aims to help an ailing economy to recover from the 2009 financial crisis. In the UK, every £1 spent on construction output generates a total of £2.84 in total economic activity[101].

Turning to managerial implications, one example is that the combination of contracting and monitoring organisations over time is found to be a more efficient way to deliver projects. Firstly, contracting costs are reduced because contracting is strategically concentrated in specific parts of the project. A similar reasoning can be applied to the appointment of management consultants. These aspects lead to savings in the building process. Secondly, the case projects that combined contracting and monitoring organisations over time were found to deliver 'on time and on budget'. This constitutes another source of efficiency, which is critical for policy-makers needing to justify the expenditure of tax-payers' money. I see the managerial implications of this study to be primarily in the domain of social innovation, that is, the adjustment of managerial practices. This complements the ongoing work on technical innovation (Cox et al., 2002a).

As I approach the end of this study, I also want to explain how it informs further research. This study only represents the start. Other directions should be explored, some of which should tackle the limitations of this study. This study can be extended to other empirical settings, such as car manufacturing (Mariotti & Delbridge, 2012) and telecommunications industries (Davis & Eisenhardt, 2011), where inter-organisational collaborations are widely used. Another key area for further research relates to social enterprises, where coordination among organisations is equally important to tackling social issues effectively. This could include organisations operating at the 'bottom of the pyramid', in whose success social relationships have a critical role to play (Ansari et al., 2012).

Further research should explore in more detail the content of contracts as an essential aspect of collaborative inter-organisational relationships (Ariño & Torre, 1998; Malhotra & Lumineau, 2011). It would be interesting to investigate to what

[101] *Construction in the UK Economy: The benefits of investment*. London: UK Contractors Group and Construction Products Association (2010).

extent the contents of contracts shape inter-organisational networks and their evolution. What are the implications for the design of contracts? This study focused on a single form of contracting, informed by the case study selection criteria. Although this was merited so as to draw attention to the need for a network perspective on issues typically dealt with from a dyadic perspective, further research need to consider the diversity of contractual arrangements that might co-exist within a single arrangement (Bradach & Eccles, 1989; Gulati et al., 2012a).

In our everyday lives, perhaps far more than we acknowledge, we are part of a ‘group of human beings trying to do something’ (Penrose, 1959). Ultimately, any chance of success is dependent on coordination among the members of the group. This task, well, is ‘like shooting a moving target’ (Thompson, 1967). However, I believe that such a task has to be meaningful for society, too. This is where management scholarship, I argue, can have a great impact: to develop insight and foresight about organisations and their contribution to the society as a whole.

References

Abell, P., Felin, T., & Foss, N. 2008. Building Micro-Foundations for the Routines, Capabilities, and Performance Links. ***Managerial and Decision Economics*** 29(6): 489-502.

Abrahamson, E., & Fombrun, C. 1994. Macrocultures: Determinants and consequences. ***Academy of Management Review***, 19(4): 728-755.

Adler, P. 1995. Interdepartmental Interdependence and Coordination: The case of the design/manufacturing Interface. ***Organization Science***, 6(2): 147-167.

Ahuja, G. 2000a. Collaboration Networks, Structural Holes, and Innovation: A longitudinal study. ***Administrative Science Quarterly*** 45(3): 425-455.

Ahuja, G. 2000b. The Duality of Collaboration: Inducements and opportunities in the formation of interfirm linkages. ***Strategic Management Journal***, 21(3): 317–343.

Ahuja, G., Polidoro, F., & Mitchell, W. 2009. Structural Homophily or Social Asymmetry? The formation of alliances by poorly embedded firms. ***Strategic Management Journal***, 30(9): 941-958.

Ahuja, G., Soda, G., & Zaheer, A. 2012. The Genesis and Dynamics of Organizational Networks. ***Organization Science*** 23(2): 434-448.

Akerlof, K. 1970. The Market for 'Lemons': Qualitative uncertainty and the market mechanism. ***Quarterly Journal of Economics***, 74(3): 448-500.

Ansari, S., Munir, K., & Gregg, T. 2012. Impact at the 'Bottom of the Pyramid': The role of social capital in capability development and community empowerment. ***Journal of Management Studies***, 49(4): 813-842.

Ansari, S., & Phillips, N. 2011. Text Me! New Consumer Practices and Change in Organizational Fields. ***Organization Science***, 22(6): 1579-1599

Ansari, S., Wijen, F., & Gray, B. 2011. Fiddling while the Ice Melts? How Organizational Scholars Can Take a More Active Role in the Climate Change Debate. ***Strategic Organization***, 9(1): 70-76.

Argote, L. 1982. Input Uncertainty and Organisational Coordination in Hospital Emergency Units. ***Administrative Science Quarterly***, 27(3): 420-343.

Ariño, A., & Torre, J. d. l. 1998. Learning from Failure: Towards an evolutionary model of collaborative ventures. ***Organization Science***, 9(3): 306-325.

Baker, G., Gibbons, R., & Murphy, K. J. 2002. Relational Contracts and the Theory of the Firm. ***Quarterly Journal of Economics***, 117(1): 39-84.

Ball, M. 1988. ***Rebuilding Construction – Economic change and the British construction industry***. London: Routledge.

Barkema, H., Shenkar, O., Vermeulen, F., & Bell, J. 1997. Working Abroad, Working with Others: How firms learn to operate international joint ventures. ***Academy of Management Journal*** 40(2): 426-442.

Barlow, J., Cohen, M., Jashapara, A., & Simpson, Y. 1997. Towards Positive Partnering. Revealing the realities in the construction industry. Bristol: Policy Press.

Barney, J., & Hansen, M. 1994. Trustworthiness as a Source of Competitive Advantage. ***Strategic Management Journal***, 15(S1): 175-190.

Bauer, M., & Gaskell, G. 2000. ***Qualitative Researching with Text, Image and Sound: A practical handbook for social research.*** London: Sage Publications.

Baum, J., Calabrese, T., & Silverman, B. 2000. Don't go it Alone: Alliance network composition and startups' performance in Canadian biotechnology. ***Strategic Management Journal***, 21(3): 267-294.

Baum, J., & Oliver, C. 1991. Institutional Linkages and Organizational Mortality. ***Administrative Science Quarterly***, 36(2): 187-218.

Baum, J., Rowley, T., Shipilov, A., & Chuang, Y.-T. 2003. Dancing with Strangers: Aspiration performance and the search for underwriting syndicate partners. ***Administrative Science Quarterly***, 50(4): 536-575.

Beamish, T., & Biggart, N. 2010. Social Heuristics: Decision making and innovation in a networked production market, ***UC Davis Graduate School of Management Research Paper No. 01-10***.

Bechky, B. 2006. Gaffers, Gofers, and Grips: Role-based coordination in temporay organizations. ***Organization Science***, 17(1): 3-21.

Beckman, C., Haunschild, P., & Phillips, D. 2004. Friends or Strangers? Firm-specific uncertainty, market uncertainty, and network partner selection. ***Organization Science***, 15(3): 259-275.

Bensaou, M., & Anderson, E. 1999. Buyer-Supplier Relations in Industrial Markets: When do buyers risk making idiosyncratic investments? ***Organization Science***, 10(4): 460-481

Bigley, G., & Pearce, J. 1998. Straining for Shared Meaning in Organization Science: Problems of trust and distrust. ***Academy of Management Review***, 23(3): 405-421.

Bingham, C., & Davis, J. 2012. Learning Sequences: Their emergence, evolution, and effect ***Academy of Management Journal***, 55(3): 611-642.

Bizzi, L., & Langley, A. 2012. Studying Processes in and Around Networks. ***Industrial Marketing Management***, 41: 224-234.

Blau, P. 1964. ***Exchange and Power in Social Life***. New York: Wiley & Sons.

Blayse, A., & Manley, K. 2004. Key Influences on Construction Innovation. ***Construction Innovation***, 4(3): 1-12.

Bonacich, P. 1987. Power and centrality: A family of measures. ***American Joumal of Sociology***, 92(5): 1170-1182.

Borgatti, S., Everett, M., & Freeman, L. 2002. ***Ucinet for Windows: Software for social network analysis***. Harvard, MA: Analytic Technologies.

Borgatti, S., & Foster, P. 2003. The Network Paradigm in Organisational Research: A review and typology. ***Journal of Management***, 29(6): 991-1013.

Borgatti, S., & Halgin, D. 2011. On Network Theory. ***Organization Science***, 22(5): 1359-1367.

Bourgeois, L., & Eisenhardt, K. 1988. Strategic Decision Processes in High Velocity Environments: Four cases studies in the microcomputer industry. ***Management Science***, 34(7): 186-835.

Bradach, J., & Eccles, R. 1989. Price, Authority, and Trust: From ideal types to plural forms. ***Annual Review of Sociology***, 15: 97-118.

Brass, D., Galaskiewicz, J., Greve, H., & Tsai, W. 2004. Taking Stock of Networks and Organisations: A multilevel perspective. ***Academy of Management Journal***, 47(6): 795-817.

Broniatowski, D. 2010. Generating Social Networks from Meetings Transcripts using Bayesian Topic Models, ***Sunbelt Social Networks Conference***. Trento, Italy.

Brown, S., & Eisenhardt, K. 1998. ***Competing on the Edge: Strategy as structured chaos***. Cambridge, Boston: Harvard Business School Press.

Burke, M., Finkelstein, L., & Dusig, M. 1999. On Average Deviation Indices for Estimating Interrater Agreement. ***Organizational Research Methods***, 2(1): 49-68.

Burt, R. 1992. ***Structural Holes: The social structure of competition***. Cambridge, MA: Harvard University Press.

Burt, R., & Knez, M. 1995. Kinds of Third-Party Effects on Trust. ***Rationality and Society***, 7(3): 255-292.

Camerer, C., & Knez, M. 1996. Coordination, Organizational Boundaries and Fads in Business Practices. ***Industrial and Corporate Change***, 5(1): 89-112.

Carley, K., & Palmquist, M. 1991. Extracting, Representing, and Analyzing Mental Models. ***Social Forces***, 70(3): 601-636.

Casciaro, T. 2003. Determinants of Government Structure in Alliances: The role of strategic, task, and partner uncertainties. ***Industrial and Corporate Change***, 12(6): 1223-1251

Casciaro, T., & Piskorski, M. 2005. Power Imbalance, Mutual Dependence, and Constraint Absorption: A closer look at resource dependence theory. ***Administrative Science Quarterly***, 50(2): 167-199.

Chung, S., Singh, H., & Lee, K. 2000. Complementarity, Status Similarity and Social Capital as Drivers of Alliance Formation. ***Strategic Management Journal***, 21(1): 1-22.

Clifton, T., & Ferreira, P. 2009. Archipelagian Cosmology: Dynamics and observables in a universe with discretized matter content ***Phys. Rev***, D 8.

Coase, R. 1937. The Nature of the Firm. ***Economica***, 4(16): 386-405.

Cohen, J. (1960). A Coefficient of Agreement for Nominal Scales. ***Educational and Psychological Measurement***, 20 (1): 37-46

Cohen, D., & Levinthal, D. 1990. Absorptive Capacity: A new perspective on learning and innovation. ***Administration Science Quarterly***, 35: 128-152.

Coleman, J. 1988. Free Riders and Zealots: The role of social networks. ***Sociological Theory*** 6(1): 52-57.

Coleman, J. 1994. ***Foundations of social theory***. Cambridge: Harvard University Press.

Colquitt, J., Scott, B., & LePine, J. 2007. Trust, Trustworthiness, and Trust Propensity: A meta-analytic test of their unique relationships with risk taking and job performance. ***Journal of Applied Psychology***, 92(4): 909-927.

Corbusier, L. 1948. ***When the Cathedrals Were White: A journey to the country of timid people*** London: Routledge.

Cox, H., Frenz, M., & Prevezer, M. 2002a. Patterns of Innovation in UK Industry: Exploring the CIS data to contrast high and low technology industries. ***Journal of Interdisciplinary Economics***, 13 (3): 267-304.

Cox, H., Mowatt, S., & Prevezer, M. 2002b. The Firm in the Information Age: Organizational responses to technological change in the processed foods sector. ***Industrial and Corporate Change***, 11(1): 135-158.

Cummings, J., & Cross, R. 2003. Structural Properties of Work Groups and Their Consequences for Performance. ***Social Networks***, 25(3): 197-210.

Cyert, R., & March, J. 1963. ***A Behavioral Theory of the Firm*** Englewood Cliffs, NewJersey: Prentice Hall.

Das, T., & Teng, B. 1998. Between Trust and Control: Developing confidence in partner cooperation in alliances. ***Academy of Management Review***, 23(3): 491-512.

Davis, G. 1991. Agents Without Principles? The spread of the poison pill through the intercorporate network. ***Administrative Science Quarterly***, 36(4): 583-613.
Davis, J., & Eisenhardt, K. 2011. Rotating Leadership and Collaborative Innovation: Recombination processes in symbiotic relationships ***Administrative Science Quarterly***, 56(2): 159-201.
de Rond, M., & Bouchikhi, H. 2004. On the Dialectics of Strategic Alliances. ***Organization Science***, 15(1): 56-69.
Diesner, J., & Carley, K. 2012. Impact of Relation Extraction Methods from Text Data on Network Data and Analysis Results, ***ACM Web Science Conference***. Evanston, IL.
DiMaggio, P. 1992. Nadel's Paradox Revisited: Relational and cultural aspects. In N. Nohria, & R. Eccles (Eds.), ***Networks and Organisations: Structure, form, and action***: 118-142. Boston: Harvard Business School Press.
DiMaggio, P., & Powell, W. 1983. The Iron Cage Revisited: Institutional isomorphism and collective rationality in organizational fields. ***American Sociological Review***, 48(2): 147-160.
Dittrich, K., Guerard, S., & Seidl, D. 2011. ***Meetings in the Strategy Process: Toward an Integrative Framework***. AoM Best Paper Proceedings of the 2011 Academy of Management Meeting, San Antonio, Texas.
Doz, Y. L. 1996. The Evolution of Cooperation in Strategic Alliances: Initial conditions or learning processes? ***Strategic Management Journal***, 17(S1): 55-83.
Durkheim, E. 1984. ***The Division of Labor in Society***. New York: Free Press.
Dyer, J., & Singh, H. 1998. The Relational View: Cooperative strategy and sources of interorganizational competitive advantage. ***Academy of Management Review***, 23(4): 660-679.
Dyer, J., & Chu, W. 2000. The Determinants of Trust in Supplier-Automaker Relationships in the U.S., Japan and Korea. ***Journal of International Business Studies***, 31(2): 259-285.
Eccles, R. 1981. The Quasifirm in the Construction Industry. ***Journal of Economic Behavior and Organisation***, 2(4): 335-357.
Eisenhardt, K. 1989. Building Theories from Case Study Research. ***Academy of Management Review***, 14(4): 532-550.
Eisenhardt, K., & Bourgeois, L. 1988. Politics of Strategic Decision Making in High-Velocity Environments: Toward a midrange theory. ***Academy of Management Journal***, 31(4): 737-770.
Eisenhardt, K., Furr, N., & Bingham, C. 2010. Organizing for Fluidity? Dilemmas of New Organizational Forms ***Organization Science***, 21(6): 1251-1262.
Eisenhardt, K., & Graebner, M. 2007. Theory Building from Cases: Opportunities and challenges. ***Academy of Management Journal***, 50(1): 25-32.
Eisenhardt, K., & Martin, J. 2000. Dynamic Capabilities: What are they? ***Strategic Management Journal***, 21(10-11): 1105-1121.
Eisenhardt, K., & Schoonhoven, C. 1996. Resource-Based View of Strategic Alliance Formation: Strategic and social explanations in entrepreneurial firms ***Organization Science***, 7(2): 136-150
Emirbayer, M., & Jeff, G. 1994. Network Analysis, Culture, and the Problem of Agency ***American Journal of Sociology*** 99(6): 1411-1154.
Estrin, S., & Barzelay, M. 2011. Design Science as a Reference Point for Management Research. In M. Morsing, & A. Sauquet (Eds.), ***Business Schools and Their Contribution to Society***. London: Sage.

Everett, M., & Borgatti, S. 2005. Extending centrality. In P. Carrington, J. Scott, & S. Wasserman (Eds.), ***Models and Methods in Social Network Analysis***. New York: Cambridge University Press.

Faems, D., Janssens, M., Madhok, A., & Van Looy, B. 2008. Toward an Integrative Perspective on Alliance Governance: Connecting contract design, trust dynamics, and contract application. ***Academy of Management Journal***, 51(6): 1053-1078.

Fischhoff, B. 1975. Hindsight ≠ foresight: The effect of outcome knowledge on judgment under uncertainty. ***Journal of Experimental Psychology: Human Perception and Performance***, 1: 288-299.

Freedman, R., & Kaufmann III, W. 2008. ***Stars and Galaxies: Universe.*** New York City: W.H. Freeman and Company.

Freeman, L. 1979. Centrality in Social Networks: Conceptual clarification. ***Social Networks***, 1(3): 215-239.

Fuchs, W., & Garicano, L. 2011. Matching Problems with Expertise in Firms and Markets. ***Journal of the European Economic Association***, 8(2-3): 354-364.

Galaskiewicz, J. 1985. Interorganizational Relations. ***Annual Review of Sociology***, 11(1): 281-304.

Galaskiewicz, J., Bielefeld, W., & Dowell, M. 2006. Networks and Organizational Growth: A study of community based nonprofits. ***Administrative Science Quarterly***, 51(3): 337-380.

Galbraight , J. 1977. ***Organization Design***. Reading, MA: Addison-Wesley.

Gambetta, D. 1988. ***Trust: Making and breaking cooperative relations***. Oxford: MA: Basil Blackwell.

Gann, D. 1991. New Management Strategies and the Fast-Track Phenomena in Britain. In H. Rainbird, & G. Syben (Eds.), ***Restructuring Traditional Industry – Construction employment an skills in Europe***: 111-132. Oxford: Berg Publishers.

Gann, D. 1996. Construction as a Manufacturing Process? Similarities and differences between industrialized housing and car production in Japan. ***Construction Management & Economics***, 14(5): 437-450.

Gargiulo, M., & Benassi, M. 2000. Trapped in Your Own Net? Network Cohesion, Structural Holes, and the Adaptation of Social Capital. ***Organization Science***, 11(2): 183-196.

George, G., Kotha, R., & Zhang, Y. 2008. The Puzzle of Insular Domains: A longitudinal study of knowledge structuration and innovation in biotechnology firms. ***Journal of Management Studies***, 45(8): 1448-1474.

George, G., Zahra, S., & Wood, D. 2002. The Effects of Business-University Alliances on Innovative Output and Financial Performance: A study of publicly traded biotechnology companies. ***Journal of Business Venturing***, 17(6): 577-609.

Ghoshal, S., & Moran, P. 1996. Bad for Practice: A critique of the transaction cost theory. ***Academy of Management Review***, 21(1): 13-47.

Gibson, D. 2005. Taking Turns and Talking Ties: Network structure and conversational sequences. ***American Journal of Sociology***, 110(6): 1561-1597.

Giddens, A. 1976. ***New Rules of Sociological Method***. New York: Basic.

Giddens, A. 1984. ***The Constitution of Society***. Cambridge: John Wiley and Sons.

Gittell, J., & Weiss, L. 2004. Coordination Networks within and across Organizations: A multi-level framework. ***Journal of Management Studies***, 41(1): 127-153.
Glaser, B., & Strauss, A. 1967. ***The Discovery of Grounded Theory***. Chicago Aldine.
Goerzen, A., & Beamish, P. 2005. The Effect of Alliance Network Diversity on Multinational Enterprise Performance. ***Strategic Management Journal***, 26(4): 333–354.
Gomes-Casseres, B. 1996. ***The Alliance Revolution - The new shape of of business rivalry***. Cambridge, MA: Harvard University Press.
Graebner, M. 2009. Caveat Venditor: Trust asymmetries in acquisitions of entrepreneurial firms. ***Academy of Management journal***, 52(3): 435-472.
Grandori, A. 1997a. Governance Structures, Coordination Mechanisms and Cognitive Models. ***Journal of management and Governance***, 1(1): 29-47.
Grandori, A. 1997b. An Organizational Assessment of Interfirm Coordination Modes. ***Organization Studies***, 18(6): 897-925
Grandori, A., & Soda, G. 1995. Inter-Firm Networks: Antecedents, mechanisms and forms. ***Organization Studies*** 16(2): 183-214.
Granovetter, M. 1973. The Strength of Weak Ties. ***American Journal of Sociology***, 78(6): 1360-1380.
Granovetter, M. 1985. Economic Action and Social Structure: The problem of embeddedness. ***American Journal of Sociology***, 91(3): 481-510.
Granovetter, M. 1992. Economic Institutions as Social Constructions: A framework for analysis. ***Acta Sociologica***, 35(1): 3-11.
Greve, H., Baum, J., Mitsuhashi, H., & Rowley, T. 2010. Built to Last but Falling Apart: Cohesion, friction, and withdrawal from interfirm alliances. ***Academy of Management journal***, 53(2): 302-322.
Gulati, R. 1995a. Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances, ***Academy of Management Journal***, 38(1): 85-112.
Gulati, R. 1995b. Social Structure and Alliance Formation Patterns: A longitudinal analysis. ***Administrative Science Quarterly***, 40(4): 619-652.
Gulati, R. 1998. Alliances and Networks. ***Strategic Management Journal***, 19: 293–317.
Gulati, R., & Gargiulo, M. 1999. Where Do Interorganizational Networks Come From? ***American Journal of Sociology***, 104(5): 1439-1493.
Gulati, R., Lavie, D., & Madhavan, R. 2011a. How do Networks Matter? The performance effects of interorganizational networks. ***Research in Organizational Behavior***, 31(0): 207-224.
Gulati, R., & Nickerson, J. 2008. Interorganizational Trust, Governance Choice, and Exchange Performance. ***Organization Science*** 19(2): 1-21.
Gulati, R., Nohria, N., & Zaheer, A. 2000. Strategic Networks. ***Strategic Management Journal***, 21(3): 203–215.
Gulati, R., Puranam, P., & Tushman, M. 2012a. Meta-Organization Design: Rethinking design in interorganizational and community contexts. ***Strategic Management Journal***, 33(6): 571-586.
Gulati, R., & Singh, H. 1998. The Architecture of Cooperation: Managing coordination costs and appropriation concerns in strategic alliances. ***Administrative Science Quarterly***, 43(4): 781-814.

Gulati, R., & Sytch, M. 2008. Does Familiarity Breed Trust? Revisiting the Antecedents of Trust. ***Managerial and Decision Economics*** 29: 165-190.
Gulati, R., Wohlgezogen, F., & Zhelyazkov, P. 2012b. The Two Facets of Collaboration: Cooperation and coordination in strategic alliances. ***Academy of Management Annals***: 6(1): 531-583.
Gulati, R., Wohlgezogen, F., & Zhelyazkov, P. 2011b. Willing and Able? Cooperation and Coordination in Strategic Alliances ***Academy of Management 2011 Annual Meeting***. San Antonio, Texas, USA.
Hall, R., Clark, J., Giordano, P., Johnson, P., & Roekel, M. 1977. Patterns of Interorganizational Relationships. ***Administrative Science Quarterly***, 22(3): 457-474.
Hallen, B. 2008. The Causes and Consequences of the Network Positions of New Organizations: From whom do entrepreneurs receive investment. ***Administrative Science Quarterly***, 53(4): 685–718.
Hansen, M. 1999. The Search-Transfer Problem: The role of weak ties in sharing knowledge across organization subunits. ***Administrative Science Quarterly***, 44(1): 82-111.
Hardy, C., Lawrence, T., & Grant, D. 2005. Discourse and Collaboration: The role of conversations and collective identity. ***Academy of Management Review***, 30(1): 58-77
Hardy, C., Phillips, N., & Lawrence, T. 2003. Resources, Knowledge and Influence: The organizational effects of interorganizational collaboration. ***Journal of Management Studies***, 40(2): 321-347.
Hargadon, A., & Sutton, R. 1997. Technology Brokering and Innovation in a Product Development Firm. ***Administrative Science Quarterly*** 42(4): 716-749.
Harrison, D., & Klein, K. 2007. What's the Difference? Diversity Constructs as Separation, Variety, or Disparity in Organisations. ***Academy of Management Journal***, 32(4): 1199-1228.
Hart, O. 1995. ***Firms, Contracts, and Financial Structure***. Oxford: Oxford University Press.
Hayes, A., & Krippendorff, K. 2007. Answering the call for a standard reliability measure for coding data. ***Communication Methods and Measures***, 1(1): 77-89.
Heath, C., & Staudenmayer, N. 2000. Coordination Neglect: How lay theories of organizing complicate coordination in organizations. In R. I. Sutton, & B. Staw (Eds.), ***Research in Organizational Behavior***: 153-193. Greenwich, CT: JAI Press.
Hillebrandt, P. 1984. ***Analysis of the British Construction Industry***. London: Macmillan Publishers.
Hills, J. 2007. Ends and Means: The future roles of social housing in England. London: Centre for Analysis of Social Exclusion.
Hitt, M., Hoskisson, R., Johnson, R., & Moesel, D. 1996. The Market for Corporate Control and Firm Innovation. ***Academy of Management Journal***, 39(5): 1084-1119.
Holm, P. 1995. The Dynamics of Institutionalization: Transformation processes in norwegian fisheries. ***Administration Science Quarterly***, 40(3): 398-422
Human, S., & Provan, K. 2000. Legitimacy Building in the Evolution of Small-Firm Multilateral Networks: A comparative study of success and demise. ***Administrative Science Quarterly***, 45(2): 327-365

Human, S., & Provan, K. G. 1997. An Emergent Theory of Structure and Outcomes in Small-Firm Strategic Manufacturing Networks. ***Academy of Management Journal***, 40(2): 368-403.

Ibarra, H. 1992. Homophily and Differential Returns: Sex differences in network structure and access in an advertising firm. ***Administrative Science Quarterly***, 37(3): 422-447.

Ibarra, H., Kilduff, M., & Tsai, W. 2005. Zooming In and Out: Connecting individuals and collectivities at the frontiers of organizational network research. ***Organization Science***, 16(4): 359-371

Ingram, P., & Torfason, M. 2010. Organizing the In-between: The population dynamics of network-weaving organizations in the global interstate network. ***Administration Science Quarterly***, 55(4): 577-605.

Jackson, D. 1988. The Construction of Voids. ***Science***, 241: 604-605.

Jarillo, J. 1995. ***Strategic Networks: Creating the borderless organization***. Oxford: Butterworth-Heinemann.

Jarzabkowski, P., & Seidl, D. 2008. The Role of Meetings in the Social Practice of Strategy. ***Organization Studies*** 29(11): 1391-1426.

Jick, T. 1979. Mixing Qualitative and Quantitative Methods: Triangulation in action. ***Administrative Science Quarterly***, 24(4): 602-611.

Jones, C., Hesterly, W., & Borgatti, S. 1997. A General Theory of Network Governance: Exchange conditions and social mechanisms. ***Academy of Management Review***, 22(4): 911-945.

Jones, C., & Lichtenstein, B. 2008. Temporary Inter-organizational Projects: How temporal and social embeddedness enhance coordination and manage uncertainity. In S. Cropper, M. Ebers, C. Huxham, & P. Ring (Eds.), ***The Oxford Handbook of Inter-organizational relations***. Oxford: Oxford University Press.

Kale, P., & Singh, H. 2009. Managing Strategic Alliances: What do we know now, and where do we get from here. ***Academy of Management Perspectives***, 23(2): 45-62.

Katila, R., Rosenberger, J., & Eisenhardt, K. 2008. Swimming with Sharks: Technology ventures, defense mechanisms and corporate relationships. ***Administrative Science Quarterly***, 53(2): 295–332.

Kenis, P., & Knoke, D. 2002. How Organizational Field Networks Shape Interorganizational Tie-Formation Rates. ***Academy of Management Review***, 27(2): 275-293.

Kilduff, M., & Brass, D. 2010. Organizational Social Network Research: Core ideas and key debates. ***Academy of Management Annals***, 4(1): 317-357.

Kogut, B., & Zander, U. 1992. Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. ***Organization Science***, 3(Focused Issue: Management of Technology): 383-397.

Kogut, B., & Zander, U. 1996. What Firms Do? Coordination, Identity, and Learning. ***Organization Science***, 7(5): 502-518.

Korczynski, M. 1996. The Low-Trust Route to Economic Development: Inter-firm relations in the UK engineering construction industry in the 1980s and 1990s. ***Journal of Management Studies***, 33(6): 787-808.

Koza, M., & Lewin, A. 2004. The Coevolution of Network Alliances: A longitudinal analysis of an international professional service network. ***Organisation Science***, 10(5): 638-653.

Krackhardt, D. 1990. Assessing the Political Landscape: Structure, cognition, and power in organizations. ***Administration Science Quarterly***, 34(2): 342-369.
Krackhardt, D. 1994. Graph Theoretic Dimensions of Informal Organizations. In K. Carley, & M. Prietula (Eds.), ***Computational Organizational Theory***: 89-111. Hillside NJ: Lawrence Erlbaum Assoc.
Krackhardt, D. 1998. Simmelian Ties: Super strong and sticky. In R. Kramer, & M. Neale (Eds.), ***Power and Influence in Organizations***: 21-38. Thousand Oaks, Ca: Sage.
Krackhardt, D., & Stern, R. 1988. Informal Networks and Organizational Crises: An experimental simulation. ***Social Psychology Quarterly***, 51(2): 123-140.
Kramer, R. 1999. Trust and Distrust in Organizations: Emerging perspectives, enduring questions. ***Annual Review of Psychology***, 50: 569-598.
Landis, J., & Koch, G. 1977. The Measurement of Observer Agreement for Categorical Data. ***Biometrics***, 33: 159-174.
Langlois, N., & Robertson, P. 1993. Business Organization as a Coordination Problem: Toward a dynamic theory of the boundaries of the firm. ***Business and Economic History*** 22(1): 31-41.
Larson, A. 1992. Network Dyads in Entrepreneurial Settings: A study of the governance of exchange relationships. ***Administrative Science Quarterly***, 37(1): 76-104.
Latham, M. 1994. Constructing the Team: Joint review of procurement and contractual arrangements in the United Kingdom construction industry. London HM Stationery Office (HMSO)
Lavie, D. 2006. The Competitive Advantage of Interconnected Firms: An extension of the resource-based view. ***Academy of Management Review*** 31(3): 638-658.
Lawrence, T., Hardy, C., & Phillips, N. 2002. Institutional Effects of Interorganizational Collaboration: The emergence of proto-institutions. ***Academy of Management Journal***, 45(1): 281-290
Lazerson, M. 1988. Organizational Growth of Small Firms: An outcome of markets and hierarchies? ***American Sociological Review***, 53(3): 330-342.
Lee, J. 2010. Heterogeneity, Brokerage, and Innovative Performance: Endogenous formation of collaborative inventor networks. ***Organization science***, 21(4): 804-822.
Leonard-Barton, D. 1990. A Dual Methodology for Case Studies: Synergistic use of a longitudinal single site with replicated multiple sites. ***Organization Science***, 1(3): 248-266.
Levine, S., & White, P. 1961. Exchange as a Conceptual Framework for the Study of Interorganizational Relationships. ***Administrative Science Quarterly***, 5(4): 583-601.
Levinthal, D., & Fichman, M. 1988. Dynamics of Interorganizational Attachments: Auditor-client relationships. ***Administrative Science Quarterly***, 33(3): 345-369.
Lumineau, F., Fréchet, M., & Puthod, D. 2011. An Organizational Learning Perspective on the Contracting Process. ***Strategic Organization***, 9(1): 8-32.
Lumineau, F., & Quélin, B. 2012. An Empirical Investigation of Interorganizational Opportunism and Contracting Mechanisms. ***Strategic Organization***, 10(1): 55-84.
Macaulay, S. 1963. Non-Contractual Relations in Business: A preliminary study. ***American Sociological Review***, 28(1): 55-67

MacDuffie, J. 2011. Inter-Organizational Trust and the Dynamics of Distrust. ***Journal of International Business Studies***, 42: 35-47.
Madhok, A. 1995. Revisiting Multinational Firms' Tolerance for Joint Ventures: A trust-based approach. ***Journal of International Business Studies***, 26(1): 117-137.
Mair, J., Marti, I., & Ventresca, M. 2012. Building Inclusive Markets in Rural Bangladesh: How intermediaries work institutional voids. ***Academy of Management Journal***, 55(4): 819-850.
Malhotra, D., & Lumineau, F. 2011. Trust and Collaboration in the Aftermath of Conflict: The effects of contract structure. ***Academy of Management Journal***, 54(5): 981-998
Malhotra, D., & Murnighan, J. 2002. The Effects of Contracts on Interpersonal Trust. ***Administrative Science Quarterly***, 47(3): 534-559.
Mariotti, F., & Delbridge, R. 2012. Overcoming Network Overload and Redundancy in Interorganizational Networks: The roles of potential and latent ties. ***Organization Science***, 33(2): 511-528.
Maurer, I., & Ebers, M. 2006. Dynamics of Social Capital and Their Performance Implications: Lessons from biotechnology start-ups. ***Administrative Science Quarterly***, 51(2): 262-292.
Mayer, R., Davis, J., & Schoorman, D. 1995. An Integrative Model of Organizational Trust. ***Academy of Management Review***, 20(3): 709-734.
McEvily, B. 2011. Reorganizing the Boundaries of Trust: From discrete alternatives to hybrid forms. ***Organization Science***, 22(5): 1266-1276.
McEvily, B., Perrone, V., & Zaheer, A. 2003. Trust as an Organizing Principle. ***Organization Science***, 14(1): 91-103.
McEvily, B., & Zaheer, A. 1999. Bridging Ties: A source of firm heterogeneity in competitive capabilities. ***Strategic Management Journal***, 20(12): 1133-1156.
McPherson, J., & Smith-Lovin, L. 1987. Homophily in Voluntary Organizations: Status distance and the composition of face-to-face groups. ***American Sociological Review***, 52(3): 370-379
Mehra, A., Brass, D., Borgatti, S., & Labianca, G. 2012. A Network Perspective on Megaengineering Projects. In S. D. Bruun (Ed.), ***Engineering earth: The impacts of megaengineering Projects***: 769-782. New York: Springer.
Miles, M., & Huberman, A. 1984. ***Qualitative Data Analysis***. Beverly Hills, CA: Sage.
Miller, C., Cardinal, L., & Glick, W. 1997. Retrospective Reports in Organisational Research: A reexamination of recent evidence. ***Academy of Management Journal***, 40(1): 189-204.
Mitev, N., & Venters, W. 2009. Reflexive Evaluation of an Academic-Industry Research Collaboration: Can model 2 management research be achieved? . ***Journal of Management Studies***, 46(5): 733-754.
Mitev, N. 1996. More than a Failure? The computerised reservation systems at French railways. ***Information Technology & People***, 9(4): 8-19.
Mitsuhashi, H., & Greve, H. R. 2009. A Matching Theory of Alliance Formation and Organizational Success: Complementarity and compatibility. ***Academy of Management Journal*** 52(5): 975 - 995.
Moody, J., McFarland, D., & Bender-DeMoll, S. 2005. Dynamic Network Visualization. ***American Journal of Sociology***, 110: 1206−1241.
Moran, P., & Ghoshal, S. 1999. Markets, Firms and the Process of Economic Development. ***Academy of Management Review***, 24(3): 390-412.

Morton, R. 2002. ***Construction UK – An introduction to the industry*** (2nd ed.). Oxford: Blackwell Publishing.

Nahapiet, H., & Nahapiet, J. 1985. A Comparison of Contractual Arrangements for Building Projects. ***Construction Management and Economics***, 3(3): 217 - 231

Nahapiet, J., & Ghoshal, S. 1998. Social Capital, Intellectual Capital, and the Organizational Advantage. ***Academy of Management Review***, 23(2): 242-266.

Nelson, R., & Winter, S. 1982. ***An Evolutionary Theory of Economic Change***. Cambridge, MA: Belknap Press.

Nickerson, J., & Silverman, B. 2003. Why Firms Want to Organize Efficiently and What Keeps Them From Doing Do: Inappropriate governance, performance, and adaptation in a deregulated industry. ***Administrative Science Quarterly***, 48(3): 433-465.

Nohria, N. 1992. Is Network Perspective a Useful Way of Studying Organisations? In N. Nohria, & R. Eccles (Eds.), ***Networks and Organisations: Structure, form, and action***: 1-13. Boston: Harvard University Press.

Nooteboom, B., Berger, H., & Noorderhaven, N. 1997. Effects of Trust and Governance on Relational Risk. ***Academy of Management Journal***, 40(2): 308-338.

Obstfeld, D. 2005. Social Networks, the Tertius Iungens Orientation, and Involvement in Innovation. ***Administrative Science Quarterly***, 50(1): 100-130.

Okhuysen, G., & Bechky, B. 2009. Coordination in Organizations: An integrative perspective. ***Academy of Management Annals***, 3(1): 463-502.

Oliveira, N. 2011. Social Network Analysis in Multiple-Case Studies: Promises, evidence, challenges and tentative solutions for 'better stories and better constructs, ***SUNBELT - XXXI Social Networks Conference***. St. Peter Beach, Florida, USA.

Oliver, A., & Ebers, M. 1998. Networking Network Studies: An analysis of conceptual configurations in the study of inter-organizational relationships. ***Organization Studies***, 19(4): 549-583.

Oliver, C. 1990. Determinants of Interorganizational Relationships: Integration and future directions. ***Academy of Management Review***, 15(2): 241-265.

Olsen, M. 1978. ***The Process of Social Organization***. New York: Holt, Rinehart & Winston.

Osborn, R. N., & Hagedoorn, J. 1997. The Institutionalization and Evolutionary Dynamics of Interorganizational Alliances and Networks. ***Academy of Management Journal***, 40(2): 261-278.

Ouchi, W. 1980. Markets, Bureaucracies, and Clans. ***Administrative Science Quarterly***, 25(1): 129-141.

Owen-Smith, J., & Powell, W. W. 2004. Knowledge Networks as Channels and Conduits: The effects of spillovers in the Boston biotechnology community. ***Organization Science***, 15(1): 5-21.

Ozcan, P., & Eisenhardt, K. 2009. Origin of Alliances Portfolios: Entrepreneurs, network strategies, and firm performance. ***Academy of Management Journal***, 52(2): 246-279.

Park, S., & Ungdon, G. 2001. Interfirm Rivalry and Managerial Complexity: A conceptual framework of alliance failure. ***Organization Science***, 12(1): 37-53.

Pearce, D. 2003. The Social and Economic Value of Construction - The construction industry's contribution to sustainable development. London: CRISP.
Penrose, E. 1959. ***The Theory of the Growth of the Firm***. New York: John Wiley and Sons.
Perrone, V., Zaheer, A., & McEvily, B. 2003. Free to Be Trusted? Organizational Constraints on Trust in Boundary Spanners. ***Organization Science***, 14(4): 422-439.
Pettigrew, A. 1990. Longitudinal Field Research on Change: Theory and practice. ***Organisation Science***, 1(3): 267-292.
Pfeffer, J., & Nowak, P. 1976. Joint Ventures and Interorganizational Interdependence. ***Administrative Science Quarterly***, 21(3): 398-418
Pfeffer, J., & Salancik, G. 1978. ***The External Control of Organisations: A resource dependence perspective***. New York: Harper and Row.
Podolny, J. 1993. A Status-Based Model of Market Competition. ***American Journal of Sociology***, 98(4): 829–872.
Podolny, J. 1994. Market Uncertainty and the Social Character of Economic Exchange. ***Administrative Science Quarterly***, 39(3): 458-483.
Podolny, J., & Page, K. 1998. Network Forms of Organization. ***Annual Review of Sociology***, 24(1): 57-76.
Polidoro, F., Ahuja, G., & Mitchell, W. 2011. When the Social Structure Overshadows Competitive Incentives: The effects of network embeddedness on joint venture dissolution. ***Academy of Management Journal***, 54(1): 203-223.
Poppo, L., & Zenger, T. 2002. Do Formal Contracts and Relational Governance Function as Substitutes or Complements? ***Strategic Management Journal***, 23(8): 707-726.
Powell, W. 1990. Neither Market Nor Hierarchy: Network forms of organization. ***Research in Organizational Behavior***, 12: 295-336.
Powell, W., Koput, K., & Smith-Doerr, L. 1996. Interorganizational Collaboration and the Locus of Innovation: Networks of learning in biotechnology. ***Administrative Science Quarterly***, 41(1): 116-145.
Prevezer, M. 2001. Ingredients in the Early Development of the US Biotechnology Industry. ***Small Business Economics***, 17(1-2): 17-29.
Provan, K., Beyer, J., & Kruytbosch, C. 1980. Environmental Linkages and Power in Resource-Dependence Relations Between Organizations. ***Administration Science Quarterly***, 25(2): 200-225
Provan, K., & Sydow, J. 2008. Evaluating Inter-Organizational Relationships. In S. Cropper, M. Ebers, C. Huxham, & P. Ring (Eds.), ***The Oxford Handbook of Inter-organizational relations***. Oxford: Oxford University Press.
Provan, K., Fish, A., & Sydow, J. 2007. Interorganizational Networks at the Network Level: A review of the empirical literature on whole networks. ***Journal of Management***, 33(3): 479-516
Provan, K., & Milward, H. 1995. A Preliminary Theory of Interorganizational Network Effectiveness: A comparative study of four community mental health systems. ***Administrative Science Quarterly***, 40(1): 1-33.
Puranam, P., Singh, H., & Zollo, M. 2006. Organising for Innovation: Managing the coordination-autonomy dilemma in thechnogy acquisitions. ***Academy of Management Journal***, 49(2): 263-280.

Reagans, R., & McEvily, B. 2003. Network Structure and Knowledge Transfer: The effects of cohesion and range. ***Administrative Science Quarterly***, 48(2): 240-267.

Reagans, R., & Zuckerman, E. 2001. Networks, Diversity, and Productivity: The social capital of corporate R&D teams. ***Organization Science***, 12(4): 502-517.

Reichstein, T., Salter, A., & Gann, D. 2008. Break on Through: Sources and determinants of product and process innovation among UK construction firms. ***Industry and Innovation***, 15(6): 601-625.

Ring, P., & van de Ven, A. 1992. Structuring Cooperative Relationships between Organizations. ***Strategic Management Journal***, 13(7): 483-498.

Ring, P., & van de Ven, A. 1994. Developmental Processes of Cooperative Interorganizational Relationships. ***Academy of Management Review***, 19(1): 90-118.

Rosenkopf, L., & Padula, G. 2008. The Micro-structure of Network Evolution: An empirical investigation of alliance formation in the mobile communications industry. ***Organization Science***, 19(5): 669-687

Rosenkopf, L., & Schleicher, T. 2008. Below the Tip of the Iceberg: The co-evolution of formal and informal interorganizational networks in the telecommunications industry. ***Managerial and Decision Economics***, 29: 425-441

Rosenkopf, L., & Tushman, M. 1998. The Coevolution of Community Networks and Technology: Lessons from the flight simulation industry. ***Industrial and Corporate Change***, 7(2): 311-346.

Rotter, J. 1971. Generalized Expectancies for Interpersonal Trust. ***American Psychologist***, 26(5): 443-452.

Rousseau, D., Sitkin, S., Burt, R., & Camerer, C. 1998. Not so Different After All: A cross-discipline view of trust. ***Academy of Management Review***, 23(3): 393-404

Rowley, T., Behrens, D., & Krackhardt, D. 2000. Redundant Governance Structures: An analysis of structural and relational embeddedness in the steel and semiconductor industries. ***Strategic Management Journal***, 21(3): 369–386.

Santos, F., & Eisenhardt, K. 2009. Constructing Markets and Shaping Boundaries: Entrepreneurial agency in nascent fields. ***Academy of Management Journal***, 52(4): 643–671.

Sapienza, H., Autio, E., George, G., & Zahra, S. 2006. A Capabilities Perspective on the Effects of New Venture Internationalization on Survival and Growth. ***Academy of Management Review***, 31(4): 914-933.

Saxton, T. 1997. The Effects of Partner and Relationship Characteristics on Alliance Outcomes. ***Academy of Management Journal***, 40(2): 443-461.

Scanlon, K., Lunde, J., & Whitehead, C. 2011. Responding to the Housing and Financial Crises: Mortgage lending, mortgage products and government policies. ***International Journal of Housing Policy***, 11(1): 23-49.

Schelling, T. 1960. ***The strategy of conflict***. Cambridge, MA: MIT Press.

Schermerhorn, J., & Shirland, L. 1981. Hospital Administrator Felt Needs for Interorganizational Cooperation and Actual Cooperative Outcomes by Their Hospitals. ***Decision Sciences***, 12(3): 486-501

Schmidt, S., & Kochan, T. 1977. Interorganizational Relationships: Patterns and motivations. ***Administrative Science Quarterly***, 22(2): 220-234.

Scott, R. 2003. ***The Gothic Enterprise: A guide to understanding the medieval cathedral***. Berkeley, CA: University of California Press.
Shapiro, S. 1987. The Social Control of Impersonal Trust. ***American Journal of Sociology***, 93(3): 623-658.
Siggelkow, N., & Levinthal, D. 2003. Temporarily Divide to Conquer: Centralized, Decentralized, and Reintegrated Organizational Approaches to Exploration and Adaptation. ***Organization Science***, 14(6): 650-669.
Simmel, G. 1950. ***The sociology of George Simmel***. Glencoe, IL: Free Press.
Simmel, G. 1956. ***Conflict and the Web of Group-affiliations*** New York: Free Press.
Simmel, G. 1971. ***On Individuality and Social Forms: Selected writings***. Chicago: University of Chicago Press.
Simon, H. 1962. The Architecture of Complexity. ***Proceedings of the American Philosophical Society***, 106(6): 467-482.
Simon, H. 1976. ***Administrative Behavior*** (3rd ed.). New York: The Free Press
Sirmon, D., Hitt, M., & Ireland, R. 2007. Managing Firm Resources in Dynamic Environments to Create Value: Looking inside the black box. ***Academy of Management Review***, 32(1): 273-292.
Smith, K., Carroll, S., & Ashford, S. 1995. Intra- and Interorganizational Cooperation: Toward a research agenda. ***Academy of Management Journal***, 38(1): 7-23.
Smyth, H. 2010. Construction Industry Performance Improvement Programmes: The UK case of demostration projects in the 'Continous Improvement' programme. ***Construction Management & Economics***, 28(1): 255-270.
Smyth, H., & Pryke, S. 2008. ***Collaborative Relationship in Construction: Developing frameworks and networks***. Oxford: Wiley-Blackwell.
Soda, G., & Usai, A. 1999. The Dark Side of Dense Networks: From embeddedness to indebtedness. In A. Grandori (Ed.), ***Interfirm networks: Organization and industrial competitiveness***: 276-302. London: Routledge.
Sorenson, O., & Stuart, T. 2001. Syndication Networks and the Spatial Distribution of Venture Capital Investments. ***American Journal of Sociology***, 106: 1546-1588.
Srikanth, K., & Puranam, P. 2010. Coordination Within vs. Across Firm Boundaries: SSRN: http://ssrn.com/abstract=1534632.
Srivastava, M., & Gnyawali, D. 2011. When Do Relational Resources Matter? Leveraging Portfolio Technological Resources for Breakthrough Innovation. ***Academy of Management Journal***, 54(4): 797-810.
Stern, N. 2006. Stern Review on The Economics of Climate Change. London: HM Treasury
Stinchcombe, A. 1985a. Contracts as Hierarchical Documents. In A. Stinchcombe, & C. Heimer (Eds.), ***Organization Theory and Project Management - Administering uncertainty in the Norwegian offshore oil***. Bergen, Norway: Norwegian University Press.
Stinchcombe, A. 1985b. Delays in Government Approavals in Norwegian Offshore Development. In A. Stinchcombe, & C. Heimer (Eds.), ***Organization Theory and Project Management - Administering uncertainty in the Norwegian offshore oil***: 296-319. Bergen, Norway: Norwegian University Press.
Stinchcombe, A. 1990. ***Information and Organization***. Berkeley and Los Angeles: University of California Press.

Strauss, A., & Corbin, J. 1990. ***Basics of Qualitative Research - Grounded theory, procedures and techniques***. Newbury Park, CA: SAGE Publications.
Stuart, T. 2000. Interorganizational Alliances and the Performance of Firms: A study of growth and innovation rates in a high-technology industry. ***Strategic Management Journal***, 21(8): 791-811.
Sydow, J., & Windeler, A. 1998. Organizing and Evaluating Interfirm Networks: A structurationist perspective on network processes and effectiveness. ***Organization Science***, 9(3): 265-284.
Sytch, M., & Gulati, R. 2012. Markets as Networks: The dynamics and implications of interorganizational network structures. In D. Teece, & M. Augie (Eds.), ***Palgrave Encyclopedia of Strategic Management***.
Teece, D. 1986. Profiting from Technological Innovation: Implications for integration, collaboration, licensing and public policy. ***Research Policy***, 15(6): 285-305.
Teece, D., Pisano, G., & Shuen, A. 1997. Dynamic Capabilities and Strategic Management. ***Strategic Management Journal***, 18(7): 509-533.
Thompson, J. 1967. ***Organizations in Action: Social sciences bases of administration***. New York: McGraw-Hill.
Thorelli, H. 1986. Networks: Between markets and hierarchies. ***Strategic Management Journal***, 7(1): 37-51.
Tichy, N., Tushman, M., & Fombrun, C. 1979. Social Network Analysis for Organisations. ***Academy of Management Review***, 4(4): 507-519.
Tortoriello, M., & Krackhardt, D. 2010. Activating Cross-Boundary Knowledge: The role of simmelian ties in the generation of innovations. ***Academy of Management Journal***, 53(1): 167-181.
Trier, M. 2004. IT-Supported Monitoring and Analysis of Social Networks in Virtual Knowledge Communities, ***Proceedings Sunbelt XXIV Conference***. Portoroz, Slovenia.
Tushman, M. 1977. Special Boundary Roles in the Innovation Process. ***Administrative Science Quarterly***, 22(4): 587-605.
Uzzi, B. 1996. The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The network effect. ***American Sociological Review***, 61(4): 674-698.
Uzzi, B. 1997. Social Structure and Competition in Interfirm Networks: The paradox of embeddedness. ***Administrative Science Quarterly***, 42(1): 36–67.
van Aken, J. 2004. Management Research Based on the Paradigm of the Design Sciences: The quest for field-tested and grounded technological Rules. ***Journal of Management Studies***, 41(2): 219-246.
van de Ven, A. 1976. On the Nature, Formation, and Maintenance of Relations among Organizations ***Academy of Management Review***, 1(4): 24-36.
van de Ven, A. 2007. ***Engaged Scholarship: A guide to organizational and social research***. Oxford: Oxford University Press.
van de Ven, A., & Gordon, W. 1984. The Dynamics of Interorganizational Coordination. ***Administrative Science Quarterly***, 29(4): 598-621.
van de Ven, A., & Huber, G. 1990. Longitudinal Field Research Methods for Studying Processes of Organisational Change. ***Organisation Science***, 1(3): 213-219.
van De Ven, A., Delbecq, A., & Koenig, R. 1976. Determinants of Coordination Modes within Organizations. ***American Sociological Review***, 41(2): 322-338.

van de Ven, A., & Poole, M. 2005. Alternative Approaches for Studying Organizational Change. ***Organization studies***, 26(9): 1377-1404.
van de Ven, A., Walker, G., & Liston, J. 1979. Coordination Patterns Within an Interorganizational Network. ***Human Relations***, 32(1): 19-36.
Vedres, B., & Stark, D. 2010. Structural Folds: Generative disruption in overlapping groups. ***American Journal of Sociology***, 115(4): 1150-1190.
Vissa, B. 2011. A Matching Theory of Entrepreneurs' Tie Formation Intentions and Initiation of Economic Exchange. ***Academy of Management journal***, 54(1): 137-158.
Walker, G., Kogut, B., & Shan, W. 1997. Social Capital, Structural Holes and the Formation of an Industry Network. ***Organisation Science***, 8(2): 109-125.
Wallis, A. 2001. ***Design-build and Building Efficiency in the early Twentieth Century United States***. Paper presented at the Construction History Society Conference.
Wasserman, S., & Faust, K. 1994. ***Social Network Analysis: Methods and applications***. New York: Cambridge University Press.
Wernerfelt, B. 1984. A Resource-Based View of the Firm. ***Strategic Management Journal***, 5(2): 171-180.
Williamson, O. 1975. ***Markets and Hierarchies***. New York: Free Press.
Williamson, O. 1979. Transaction Cost Economics: The governance of contractual relations. ***Journal of Law and Economics***, 22(2): 233-261.
Williamson, O. 1981. The Economics of Organization: The transaction cost approach. ***American Journal of Sociology***, 87(3): 548-577
Williamson, O. 1993. Calculativeness, Trust, and Economic Organization. ***J. Law Econom***, 36(1): 453-486.
Williamson, O. 1996. ***The Mechanisms of Governance*** New York: Oxford University Press.
Williamson, O. E. 1991. Comparative Economic Organization: The analysis of discrete structural alternatives. ***Administrative Science Quarterly***, 36(2): 269-296.
Winch, G. 2003. How Innovative Is Construction? Comparing aggregated data on construction innovation and other sectors – a case of apples and pears. ***Construction Management and Economics***, 21(6): 651-654.
Yin, R. 1994. ***Case Study Research - Design and methods*** (3rd Ed.). Newbury Park, CA: Sage Publications.
Zaheer, A., Gözübüyük, R., & Milanov, H. 2010. It's the Connections: The network perspective in interorganizational research. ***Academy of Management Perspectives***, 24(1): 62-77.
Zaheer, A., McEvily, B., & Perrone, V. 1998. Does Trust Matter? Exploring the Effects of Interorganizational and Interpersonal Trust on Performance. ***Organization Science***, 9(2): 141-159.
Zaheer, A., & Soda, G. 2009. Network Evolution: The origins of structural holes. ***Administrative Science Quarterly***, 54(1): 1-31.
Zaheer, A., & Venkatraman, N. 1995. Relational Governance as an Interorganizational Strategy: An empirical test of the role of trust in economic exchange. ***Strategic Management Journal***, 16(5): 373-392.
Zaheer, A., & Zaheer, S. 1997. Catching the Wave: Alertness, responsiveness, and market influence in global electronic networks ***Management Science***, 43(11): 1493-1509.

Zajac, E. J., & Olsen, C. P. 1993. From Transaction Cost to Transactional Value Analysis: Implications for the study of interorganizational strategies. ***Journal of Management Studies***, 30(1): 131-145.

Zollo, M., Reuer, J., & Singh, H. 2002. Interorganizational Routines and Performance in Strategic Alliances. ***Organization Science***, 13(6): 701-713.

Zollo, M., & Winter, S. 2002. Deliberate Learning and the Evolution of Dynamic Capabilities. ***Organization Science***, 13(3): 339-351.

Zucker, L. 1986. Production of Trust: Institutional sources of economic structure. In B. Staw, & L. Cummings (Eds.), ***Research in organizational behavior***, Vol. 8. Greenwich, CT: JAI Press.

Zumer, S., M. Ravnik, T. Porenta, G.P. Alexander, J.M. Yeomans, (2010). Blue phases as templates for 3D colloidal photonic crystals, **Proceedings of SPIE 7775, 77750H** (retrieved from http://spie.org/x42386.xml at 26/04/2012).

Appendices

APPENDICES 1 Methodology (Chapter III)

APPENDICES 2 Consequences of Coordination (Chapter IV)

APPENDICES 3 Mechanisms of Coordination (Chapter V)

APPENDICES 4 Coordination Problems (Chapter VI)

APPENDICES 5 A Theory of Coordination Voids (Chapter VII)

APPENDICES 6 Multimedia Visualisations

Appendix 1.1 UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007)

Section F Construction

41 Construction of buildings
- 41.1 Development of building projects
  - 41.10 Development of building projects
- 41.2 Construction of residential and non-residential buildings
  - 41.20 Construction of residential and non-residential buildings
  - 41.20/1 Construction of commercial buildings
  - 41.20/2 Construction of domestic buildings

42 Civil engineering
- 42.1 Construction of roads and railways
  - 42.11 Construction of roads and motorways
  - 42.12 Construction of railways and underground railways
  - 42.13 Construction of bridges and tunnels
- 42.2 Construction of utility projects
  - 42.21 Construction of utility projects for fluids
  - 42.22 Construction of utility projects for electricity and telecommunications
- 42.9 Construction of other civil engineering projects
  - 42.91 Construction of water projects
  - 42.99 Construction of other civil engineering projects n.e.c.*

43 Specialised construction activities
- 43.1 Demolition and site preparation
  - 43.11 Demolition
  - 43.12 Site preparation
  - 43.13 Test drilling and boring
- 43.2 Electrical, plumbing and other construction installation activities
  - 43.21 Electrical installation
  - 43.22 Plumbing, heat and air-conditioning installation
  - 43.29 Other construction installation
- 43.3 Building completion and finishing
  - 43.31 Plastering
  - 43.32 Joinery installation
  - 43.33 Floor and wall covering
  - 43.34 Painting and glazing
  - 43.34/1 Painting
  - 43.34/2 Glazing
  - 43.39 Other building completion and finishing
- 43.9 Other specialised construction activities
  - 43.91 Roofing activities
  - 43.99 Other specialised construction activities n.e.c.*
    - 43.99/1 Scaffold erection
    - 43.99/9 Specialised construction activities (other than scaffold erection) n.e.c.*

* 'Not elsewhere classified' (n.e.c.)

Source: UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007, p. 39) – Structure and explanatory notes. London: Office for National Statistics.

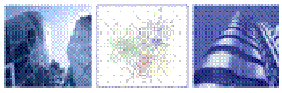
Appendix 1.2 RIBA's Plan of Work Stages

The RIBA Plan of Work describes the activities from appraisal (Stage A) of the client's requirements to post practical completion (Stage L) of the project. This is summarised in outline as far as possible but the exact way in which different Stages are conducted within the overall project programme needs careful consideration at the outset. (It is worth noting that the RIBA Plan of Work was originally developed to reflect the needs of Traditional contract forms.)

		RIBA Work Stages		Description of key tasks
Preparation	A	**Appraisal**		Identification of client's needs and objectives, business case and possible constraints on development. Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.
Preparation	B	**Design Brief**		Development of initial statement of requirements into the Design Brief by or on behalf of the client confirming key requirements and constraints. Identification of procurement method, procedures, organisational structure and range of consultants and others to be engaged for the project.
Design	C	**Concept**		Implementation of Design Brief and preparation of additional data. Preparation of Concept Design including outline proposals for structural and building services systems, outline specifications and preliminary cost plan. Review of procurement route.
Design	D	**Design Development**		Development of concept design to include structural and building services systems, updated outline specifications and cost plan. Completion of Project Brief. *Application for detailed planning permission.*
Design	E	**Technical Design**		Preparation of technical design(s) and specifications, sufficient to co-ordinate components and elements of the project and *information for statutory standards and construction safety.*
Pre-Construction	F	**Production Information**	F1	Preparation of production information in sufficient detail to enable a tender or tenders to be obtained. *Application for statutory approvals.*
			F2	*Preparation of further information for construction required under the building contract.*
Pre-Construction	G	**Tender Documentation**		*Preparation and/or collation of tender documentation in sufficient detail to enable a tender or tenders to be obtained for the project.*
Pre-Construction	H	**Tender Action**		*Identification and evaluation of potential contractors and/or specialists for the project.* *Obtaining and appraising tenders; submission of recommendations to the client.*
Construction	J	**Mobilisation**		Letting the building contract, appointing the contractor. Issuing of information to the contractor. Arranging site hand over to the contractor.
Construction	K	**Construction to Practical Completion**		Administration of the building contract to Practical Completion. Provision to the contractor of further Information as and when reasonably required. Review of information provided by contractors and specialists.
Use	L	**Post Practical Completion**	L1	Administration of the building contract after Practical Completion and making final inspections.
			L2	Assisting building user during initial occupation period.
			L3	Review of project performance in use.

Source: The Outline Plan of Work 2007, The Royal Institute of British Architects (RIBA), London..

Appendix 1.3 Research Project's Brief



Inter-firm networks - the intangible element in building projects

Nuno Oliveira – Department of Management, LSE

I think that you have chosen an important subject for your PhD and your research could contribute to the work that is going on right now to improve performance in the construction industry

CEO at one of the UK's leading construction companies

Aim

This research aims at understanding the inter-firm network of collaboration among firms engaged in building projects. This research will deliver a strategic management perspective on inter-firm interaction throughout the build process with a particular emphasis on the communication among firms regarding the accomplishment of environmental sustainability in new buildings.

Advances

This research will contribute to the literature in strategic management by advancing our understanding on the dynamics of inter-firm networks during the project (from conception to completion).

Construction is regarded as one of the UK's most adversarial sectors. So, if we want to embrace partnering, insights on inter-firm collaboration are needed. You will find in this research a substantial effort to understand the causes of lack of collaboration and miscommunication across the project network.

Type of data

1st Stage – Interviews with experts (e.g., clients, architects, engineers, main contractors) who will contribute with their views/experience in the construction processes.

2nd Stage - Data tracking the set of ties in a project (e.g., list of suppliers). Additionally a concise questionnaire will be sent to the participants in the project; the questions would be on collaboration with other firms, trust and environmental sustainability.

Research outcomes

You will be able to visualise and understand the evolution of the inter-firm network. The research will deliver a comprehensive diagnostic of the enhancing and harming network elements, as well as advice for further improvement.

Products

- A PhD thesis and academic papers;
- An executive summary of the research with practice advice will be given to the participating firms.

*** All the data will be dealt with strict confidentiality and in compliance with the code of ethics for research practice ***

Appendix 1.4 Exploratory Interviews

Ref. #	Job Position	Organisation's activity	Area of expertise	Role	Date (2010)	Notes
EI#1	Course Director for MSc Project and Enterprise Management	Leading university in teaching of civil engineering and construction management	Inter-firm collaboration in the construction industry (e.g., large projects of infra-structures)	Academic expert	28th February	**Recorded** Very enthusiastic. I was advised about the complexity of the contractual forms and inter-organisational relationships
EI#2	Senior Lecturer and Director of Postgraduate Research	Leading university in the teaching of civil engineering and construction management	Inter-firm trust in the construction industry	Academic expert	3rd March	**Recorded** Very supportive. He felt I was very well-versed with the relevant literature
EI#3	Founder and partner at architects' practice	Architects' practice	Design of medium projects across many industries. Experience of designing social housing developments	Architect	4th March	**Recorded** Exceptional insight into the relationships of conflict among organizations working in building projects
EI#4	Director at one of UK's construction industry think-thank	Organisation in charge of the agenda for UK's construction industry	Construction. Particular interest in collaboration and procurement for environmental sustainable building	Policy-maker	20th April	**Recorded** Politically-driven discourse (defensive approach)
EI#5	Professor of Construction Management and Economics	Leading university in the teaching of civil engineering and construction management	Organisational management theory and management and economics in the construction industry	Academic expert (editor of the leading academic journal)	26th April	**Recorded** Great guidance in identifying 'problem misspecification' in conceptualising inter-organizational collaboration in the building industry
EI#6	Professor of Technology and Innovation Management	Leading business school in teaching and researching (focus on construction management)	Adoption of innovation in complex industries; notably, in construction and health care	Academic expert	22nd April	**Recorded** Insightful in terms of trade press. Pessimistic about the success of studying trust in the building industry
EI#7	Environmental sustainability manager	Estates division of one of UK's leading universities	Environmental sustainability in new residential and university campus	Environmental sustainability credentials	15th April	**Recorded** Emphasis on communication problems among organisation in building projects. Very enthusiastic
EI#9	Director of Business Development	One of the UK's providers of social housing	Development and management of housing projects (client's perspective)	Private client (charity status)	22nd April	**Recorded** Good understanding of the procurement arrangements. Tense during the interview
EI#10	Chief Executive Officer (CEO) at a main contractor	UKs leading privately-owned contractor of construction	Construction industry and offsite construction	Main contractor	12th April	**Recorded** Great link between practice and critical thinking
EI#11	Head of Strategy and Sustainable Development	One of the UK's largest privately-owned firms of capital works, regeneration and support services	Environmental and social sustainability across main contractor's the supply chain	Main contractor	20th May	**Recorded** Emphasis on monitoring of the supply chain
EI#12	Bid Sustainability Manager	One of the world's leading construction firms with expertise in construction, development of	Management of portfolio of suppliers in PFI initiatives in the UK' sector of health care	Manager of public-private partnerships	23rd June	**Recorded** Emphasis on Public-Private Partnerships (PPP's) in the health care sector

		commercial and residential projects				
EI#13	Director of funding agency	This agency works with Local Authorities, Trusts, Educational and Corporate establishments wanting to apply for public funding	Experience in project management, design and building funding. Specialised in sports and leisure facilities	Consultant (funding raising on client's behalf)	5th June	**Recorded** Business-oriented
EI#14	Chief Executive of Professional Body in the building industry	To promote the highest standards of professionalism in property industry	More than 14 years board level experience in multi-disciplinary and international organisations	Professional body	17th May	**Recorded** Personal opinion. Emphasis was on bad experiences within the building industry
EI#15	Director of Pre-fab company	Portugal's pioneering company in wooden pre-fab construction	Prior experience in the UK's building industry	Pre-fab firm	7th January and 3rd April	**Not recorded** Solid understand of the industry at both national and internationally
EI#16	Head of Development and Strategy at a main contractor	Portugal's biggest and most innovative building firm with a strong presence in the renewable energy	Strategic management of building firms (e.g. alliances and entry in new markets)	Strategy and planning at a major contractor	17th December (2009)	**Not recorded** Insightful on strategic management practice
EI#17	Professor of management and editor at an academic journal.	An international business school with one of the world's leading research centres on organisational theory applied to the building industry	Researcher on inter-firm trust and theory of the firm	Academic expert	7th May	**Not recorded** Acknowledged my good understanding of key debates on the theory of the firm, particularly on trust
EI#18	Private clients perspective (household)	Owner of a HUF HAUS – one of Europe's leaders in post and beam design.	Owner of a pre-fab home; this technique is acknowledge as an alternative to on-site construction	Private client	21st May	**Via email** Sharp identification of key collaboration issues among professionals private client's perspective
EI#19	Dean's Professor of Leadership	USA's leading university in the management field	Organisational behaviour scholar interested in trust and how it may be affected by political structures and economic conditions	Academic expert	12th May	**Not recorded** Good link to the organisational behaviour theory
EI#20	Head of estates division	Estates division at one of UK's leading universities	Experience in managing facilities and new projects of university buildings	University client	15th June	**Not recorded** Enthusiastic and supportive drawing links to personal experience
EI#21	Professor of Information Systems	University and world's leading research centre on the management practices	Qualitative studies of how team members in building projects use information	Academic expert	5th May	**Not recorded** Informal interview at an academic conference
EI#22	Managing partner	A research-based architectural design with reputation for innovation in regeneration and master planning.	The challenge of designing to different actors across the UK	Architect	26th May	**Not recorded** Key idea: architecture practice as a constant negotiation among actors
EI#23	Elected member of a local council	A typical council. They represent a public client that manages and builds social housing	Public procurement of building – e.g. sports facilities and social housing	Health & Safety Advisor	26th May	**Not recorded** Examples of 'good' and 'bad' in the county

EI – Exploratory Interview

Appendix 1.5 (A) Explanatory Interview Guide (Practitioners)

Inter-firm Collaboration, Trust and the Delivery of Environmentally Sustainable Construction

Exploratory interview no. ___

(To be filled in at the end of interview)

Interviewee's identification

Company's name _____	Date ___ / ___ / ___
Job position _____	Venue _____
Name _____	Recorded Y / N
Contact_____	

(1 - Make sure I introduce myself and the project to the interviewee; 2 – Ensure that the interviewee has a clear idea about the research goals; 3 – Paraphrase the questions always the answers are vague, but follow up on emerging themes)

A| Personal experience / sector overview

1 – For how long have you been in the construction sector? Which job positions have you taken in your career?
2 – If I might, could you please tell me what episodes in your career you remember the best? Why?
3 – If you could describe the inter-firm collaboration practices in the construction sector in a paragraph, how would you describe them?
4 – To what extant do you consider that the legal framework affect the collaboration among firms (e.g., incentives)?

B| Inter-firm collaboration practices

1 – How is inter-firm collaboration important for your business?
2 - Which type of the companies/organisations do you need to collaborate with? Why?
4- Which factors might hamper inter-firm collaboration? Which factors might facilitate collaboration?
5 – Could you describe both a successful and unsuccessful collaboration?
5 – Which type of contracts do you have with other companies?

C| Trust

1- If I ask you to describe trust, how would you describe it for me?
2 - What characteristics do you look for in others, in terms of behaviours, attitudes, to assess whether you can trust them?
3 – Does the level of trust influence the contracts? Could you provide with some examples?
4- Would you have any whereby trust affects the relationship of (name of the company) and your suppliers?
5 – Would you interrupt collaboration with a company and restart collaboration later on? Why?

D| Value of trust

1. Is trust important for (name of the company)? Why?

2 - Can you give an example of when trust was an issue?
4. How much do you value the existence of trust in inter-firm collaboration? Why?
4. In which situations/projects do you think that trust is more important?

E| Uncertainty

(Note: We are moving towards the end of this interview, yet I am wondering about the importance of the uncertainty in the construction sector for the phenomenon we have been describing)

1. I understand uncertainty is major factor in the sector. Is that correct?
2. Please tell me more about the sources of uncertainty. Why do these sources affect (name of the company)?
3. Could you please give me an example how uncertainty can affect the level of trust?

F| Sustainability

(Note: It is my understanding that one of the reasons why (name of the company) engages in collaboration arrangements is to create value for the business (e.g. delivery of sustainable solutions for the clients.)

1 – How important is collaboration for the delivery of environmental sustainable solutions in the buildings?
2 – How do companies/organisations collaborate to make it possible?
3 – If I tell you the following statement – *there is a link between trust among firms and what those companies can delivery in terms of product environmental sustainability* – how would you comment on it?

Is there any thought you would like to add to this interview?
(Thank the interviewee for his/her time and precious collaboration and views)

Appendix 1.5 (B) Exploratory Interview Guide (Researchers)

Inter-firm Collaboration, Trust and the Delivery of Environmentally Sustainable Construction

Exploratory interview no. ___

(To be filled in at the end of interview)

Interviewee's identification

Name _____	Date ___ / ___ / ___
Job position _____	Venue _____
Name _____	Recorded Y / N
Contact_____	

(1 - Make sure I introduce myself and the project to the interviewee; 2 – Ensure that the interviewee has a clear idea about the research goals; 3 – Paraphrase the questions always the answers are vague, but follow up on emerging themes)

To introduce myself and my research project (research question; theoretical framework; and research strategy)

A| Research question

This research focuses on small scale projects.

1 – How would you describe the inter-firm collaboration in the construction sector?

2 – How would you explain the current situation of lack of trust and adversarial strategies?

B| Theoretical framework

An inevitable debate is about the nature of the construction firm (e.g., temporary structures, low capacity of knowledge transfer).

1 – Would you share the view that there is a negative relationship between controls (e.g., rigid contracts) and trust-building among firms?

2 – Would you agree that trust is a resource embedded in the inter-firm collaboration ties? Why?

3 –What is trust in the construction sector? How would you compare it to other sectors?

4 – How do you see the contractor's capacity to create high-quality relationships with the suppliers, even though the environment is characterised by adversarial strategies and low levels of trust?

C| Research strategy

Being a large and heterogeneous sector, I have decided to study projects from a case-study perspective.

1 – One of the elements of this research is the communication networks within projects, how do you feel that the communication practices in the sector affect research strategy? (For example, there is a preference of the use of the phone over the email; thus to chart the email flow may be not enough.)

D| Practical advice

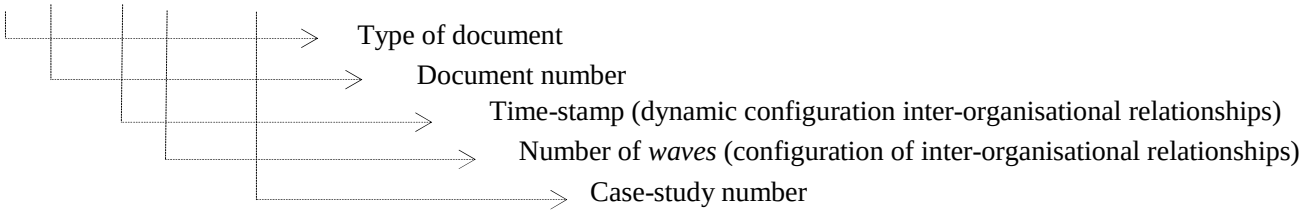
1 - Contrary to other sectors, construction is underrepresented within management research. Additionally it is operated by professional mostly trained in the 'hard-sciences'. Do you see in this a challenge for a management research project? Why?
2 – From your experience, what are the main issues when doing research in this sector?

Is there any thought you would like to add to this interview?
(Thank the interviewee for his/her time and precious collaboration and views)

Appendix 1.6 List of Material

Referencing System

MM01 - W1/12 – Case#1



Note: I combine the *wave* number and the total numbers of *waves* (e.g. W1/12) in the referring system in order to enhance the temporal traceability of material within the time span of each project.

Reference	**Type of Document**[+]	**Date (Wave)**	**Description**	**Notes (Obs.)**
Dale Lane (Case#1)				
MM01-W1/12-Case#1	Meeting Minutes (MM)	Apr-08 (Wave1)	Review meeting	Microsoft Word file
MM02-W2/12-Case#1	Meeting Minutes (MM)	Jun-08 (Wave 2)	Progress meeting	PDF file (scanned). With handwritten amends to the minutes).
MM03-W3/12-Case#1	Meeting Minutes (MM)	Jul-08 (Wave3)	Progress meeting	PDF file
MM04-W4/12-Case#1	Meeting Minutes (MM)	Sep-08 (Wave4)	Progress meeting	PDF file
MM05-W5/12-Case#1	Meeting Minutes (MM)	Oct-08 (Wave5)	Progress meeting	PDF file
MM06-W6/12-Case#1	Meeting Minutes (MM)	Nov-08 (Wave6)	Progress meeting	PDF file
MM07-W7/12-Case#1	Meeting Minutes (MM)	Dec-08 (Wave7)	Progress meeting	PDF file
MM08-W8/12-Case#1	Meeting Minutes (MM)	Jan-09 (Wave8)	Progress meeting	PDF file
MM09-W9/12-Case#1	Meeting Minutes (MM)	Feb-09 (Wave9)	Progress meeting	PDF file

MM10-W10/12-Case#1	Meeting Minutes (MM)	Mar-09 (Wave10)	Progress meeting	PDF file
MM11-W11/12-Case#1	Meeting Minutes (MM)	Apr-09 (Wave11)	Progress meeting	PDF file
MM12-W12/12-Case#1	Meeting Minutes (MM)	May-09 (Wave12)	Project Delivery Team Meeting	Microsoft Word file
MA01-W1-Case#1	Meeting Agenda (MA)	Jun-08	Meeting agenda	PDF file (scanned version)
MA02-W11-Case#1	Meeting Agenda (MA)	Apr-09	Meeting agenda	Microsoft Word file
SM01-W11-Case#1	Site Meeting Notes (SM)	Apr-09	Notes from site meeting	Microsoft Word file
CF01-Case#1	Cash Flow Map (CF)	Project document	Cash Flow Map as issued by the client	Microsoft Excel file
PD01-Case#1	Project Team Directory (PD)	Project document	Directory of Organisations members and their contact details.	Microsoft Excel file
BP01-Case#1	Board Paper (BP)	Aug-08	Report to the Financial Planning Committee	Annex 1 Site Visuals Annex 2 Site Valuation
CC01- Case#1	Construction Contract (CC)	Jul-08	Report to the Financial Planning Committee	PDF file
EE01-Case#1	Email Exchange (EE)	Dec-10	Email exchange SbD officer with the local police and I.	Electronic format (Microsoft Outlook message). Further information on the SbD certification for the building.
PI01-Case#1	Phone Interview (PI)	Dec-10	Phone ‘interview’ between the officer at the local police and I regarding the SbD certification.	Handwritten notes
Fulmar Road (Case#2)				
MM01-W1/18-Case#2	Meeting Minutes (MM)	Jun-09 (Wave1)	Progress meeting	PDF file
MM02-W2/18-Case#2	Meeting Minutes (MM)	Jul-09 (Wave2)	Progress meeting	PDF file
MM03-W3/18-Case#2	Meeting Minutes (MM)	Aug-09 (Wave3)	Progress meeting	PDF file
MM04-W4/18Case#2	Meeting Minutes (MM)	Nov-09 (Wave4)	Progress meeting	PDF file
MM05-W5/18-Case#2	Meeting Minutes (MM)	Jan-10 (Wave5)	Progress meeting	PDF file (Held on Jan, 5; it refers to December)*.
MM06-W6/18-Case#2	Meeting Minutes (MM)	Feb-10 (Wave6)	Progress meeting	PDF file (Held on Feb, 4; it refers to January)*.

MM07-W7/18-Case#2	Meeting Minutes (MM)	Feb-10 (Wave7)	Progress meeting	PDF file
MM08-W8/18-Case#2	Meeting Minutes (MM)	Mar-10 (Wave8)	Progress meeting	PDF file
MM09-W9/18-Case#2	Meeting Minutes (MM)	Apr-10 (Wave9)	Progress meeting	PDF file
MM10-W10/18-Case#2	Meeting Minutes (MM)	May-10 (Wave10)	Progress meeting	PDF file
MM11-W11/18-Case#2	Meeting Minutes (MM)	Jul-10 (Wave11)	Progress meeting	PDF file (Held on Jul, 6; it refers to June)*.
MM12-W12/18-Case#2	Meeting Minutes (MM)	Jul-10 (Wave12)	Progress meeting	PDF file
MM13-W13/18-Case#2	Meeting Minutes (MM)	Aug-10 (Wave13)	Progress meeting	PDF file
MM14-W14/18-Case#2	Meeting Minutes (MM)	Sep-10 (Wave14)	Progress meeting	PDF file
MM15-W15/18-Case#2	Meeting Minutes (MM)	Oct-10 (Wave15)	Progress meeting	PDF file
MM16-W16/18-Case#2	Meeting Minutes (MM)	Nov-10 (Wave16)	Progress meeting	PDF file
MM17-W17/18-Case#2	Meeting Minutes (MM)	Dec-10 (Wave17)	Progress meeting	PDF file
MM18-W18/18-Case#2	Meeting Minutes (MM)	Jan-11 (Wave18)	Progress meeting	PDF file
MA01-Case#2	Meeting Agenda (MA)	Jun-09	Meeting agenda and meeting schedule for the entire project.	PDF file
BP01-Case#2	Board Paper (BP)	May-09	Report to the Financial Planning Committee	PDF file Annex 1 Aerial view of site Annex 2 Maps indicating existing & proposed stock Annex 3 Indicative site view Annex 4 Development outputs
CC01-Case#2	Construction Contract (CC)	Dec-09	Report to the Financial Planning Committee	PDF file
PD01-Case#2	Project Team Directory (PD)	Not available	Directory of organisations members and their contact details.	Microsoft Word document
CF01-Case#2	Cash Flow Map (CF)	Not available	Cash Flow Map as issued by the client	Microsoft Excel file
EE01-Case#2	Email Exchange (EE)	Dec-10	Email exchange building control with the local council and I	Electronic format (Microsoft Outlook message). Information about the

				ownership of the plot land (given by the local council to the client).
EE02-Case#2	Email Exchange (EE)	Nov-10	Email exchange between the Programme Delivery Manager with the client and I.	Electronic format (Microsoft Outlook message). Information about project management.
EC01-Case#2	Environmental Certificates (EC)	Feb-11	Individual Environmental Certificates for the plots from 1-8 (48 pages).	PDF file
North Wingfield (Case#3)				
MM01-W1/19-Case#3	Meeting Minutes (MM)	Feb-08 (Wave1)	Development meeting	PDF file (scanned version). With handwritten notes).
MM02-W2/19-Case#3	Meeting Minutes (MM)	Mar-08 (Wave2)	Development meeting	PDF file (scanned version)
MM03-W3/19-Case#3	Meeting Minutes (MM)	Jun-08 (Wave3)	Progress meeting	PDF file (scanned version)
MM04-W4/19-Case#3	Meeting Minutes (MM)	Sep-08 (Wave4)	Progress meeting	PDF file (scanned version)
MM05-W5/19-Case#3	Meeting Minutes (MM)	Nov-08 (Wave5)	Progress meeting	PDF file. (Held in November, 5; it refers to October)*.
MM06-W6/19-Case#3	Meeting Minutes (MM)	Dec-08 (Wave6)	Progress meeting	PDF file. (Held in December, 3; it refers to November)*.
MM07-W7/19-Case#3	Meeting Minutes (MM)	Jan-09 (Wave7)	Progress meeting	PDF file. (Held in January, 7; it refers to December, 2009)*.
MM08-W8/19-Case#3	Meeting Minutes (MM)	Jan-09 (Wave8)	Progress meeting	PDF file. (Held in January, 7; it refers to December, 2009)*.
MM09-W9/19-Case#3	Meeting Minutes (MM)	Feb-09 (Wave9)	Progress meeting	PDF file. (Held in February, 3; it refers to January)*.
MM10-W10/19-Case#3	Meeting Minutes (MM)	Jan09 (Wave10)	Progress meeting	PDF file. (Held in March, 4; it refers to February)*.
MM11-W11/19-Case#3	Meeting Minutes (MM)	Apr-09 (Wave11)	Progress meeting	PDF file. (Held in April, 1; it refers to March)*.
MM12-W12/19-Case#3	Meeting Minutes (MM)	Jun-09 (Wave12)	Progress meeting	PDF file. (Held in June 3; it refers to May)*.

MM13-W13/19-Case#3	Meeting Minutes (MM)	Jul-09 (Wave13)	Progress meeting	PDF file. (Held in July, 1; it refers to June)*.
MM14-W14/19-Case#3	Meeting Minutes (MM)	Jul-09 (Wave14)	Progress meeting	PDF file
MM15-W15/19-Case#3	Meeting Minutes (MM)	Jul-09 (Wave15)	Progress meeting	PDF file
MM16-W16/19-Case#3	Meeting Minutes (MM)	Aug-09 (Wave16)	Progress meeting	PDF file
MM17-W17/19Case#3	Meeting Minutes (MM)	Sept-09 (Wave17)	Progress meeting	PDF file
MM18-W18/19-Case#3	Meeting Minutes (MM)	Oct-09 (Wave18)	Progress meeting	PDF file
MM19-W19/19-Case#3	Meeting Minutes (MM)	Dec-09 (Wave10)	Progress meeting	PDF file
MM20-Case#3	Meeting Minutes (MM)	Jan-08	Pre-start meeting	PDF file
MM21-Case#3	Meeting Minutes (MM)	Feb-08	Project Delivery Team Meeting	PDF file
MM22-Case#3	Meeting Minutes (MM)	Jun-08	Project Delivery Team Meeting	PDF file
MM23-Case#3	Meeting Minutes (MM)	Nov-08	Project Delivery Team Meeting	Microsoft Word file
MM24-Case#3	Meeting Minutes (MM)	May-09	Site meeting	PDF file
MA01-Case#3	Meeting Agenda (MA)	Jan-08	Meeting agenda	PDF file (scanned version); With handwritten notes). Annex 1 Gantt chart
PA01-Case#3	Planning Approvals (PA)	Nov-08	Discharge of planning conditions document	PDF file
BP01-Case#3	Board Paper (BP)	Jan-08	Report to the Financial Planning Committee	Annex 1 Site layout Annex 2 Areal view of the site Annex 3 Site Valuation
CF01-Case#3	Cash Flow Map (CF)	Not available	Cash Flow Map as issued by the client	Microsoft Excel file
EE01-Case#3	Email Exchange (EE)	Dec-10	Email exchange between a specialist supplier of environmental sustainable solutions and I.	Electronic format (Microsoft Outlook message). Information about the biomass system installed in the building.
EE02-Case#3	Email Exchange (EE)	Dec-10	Email exchange between quantity surveyor at the main contractor and I.	Electronic format (Microsoft Outlook message). Additional information on delays.

EE03-Case#3	Email Exchange (EE)	Nov-10	Email exchange the project manager with the client and I.	Electronic format (Microsoft Outlook message)
EE04-Case#3	Email Exchange (EE)	Dec-10	Email exchange between a specialist consultant in environmental sustainability and I.	Electronic format (Microsoft Outlook message)
EE05-Case#3	Email Exchange (EE)	Nov-10	Email exchange between the building control officer with the local council and I.	Electronic format (Microsoft Outlook message). Additional clarification on the SbD certification.
EE06-Case#3	Email Exchange (EE)	Dec-10	Email exchange between the staff member with the main contractor and I.	Electronic format (Microsoft Outlook message).
EE07-Case#3	Email Exchange (EE)	Dec-10	Email exchange between officer at the building control and I.	Electronic format (Microsoft Outlook message). Information about building certification and direct contact details.
PI01-Case#3	Phone Interview (PI)	Jan-11	Phone interview between the officer at the local police and I regarding the SbD certification.	Handwritten notes
PI02-Case#3	Phone Interview (PI)	Mar-11	Phone interview between the client's project manager and I.	
RD01-Case#3	Related Documentation (RD)	Sep-10	INSITE, Vol.7 Issue2. (partner organisation's journal)	PDF file (available on-line)
RD02-Case#3	Related Documentation (RD)	Dec-10	Newsletter by the client	PDF file (available on-line)
EC01-Case#3	Environmental Certificates (EC)	Jan-10	Individual Environmental Certificates for the plots 1-23 (118 pages).	PDF file
Rowlett Road (Case#4)				
MM01-W1/8-Case#4	Meeting Minutes (MM)	Mar-08 (Wave1)	Development meeting	PDF file (scanned version)
MM02-W2/8-Case#4	Meeting Minutes (MM)	May-08 (Wave2)	Development meeting	PDF file (Held in May, 1; it refers to April)*.
MM03-W3/8-Case#4	Meeting Minutes (MM)	May-08 (Wave3)	Development meeting	PDF file (Held in May, 1; it refers to April)*.

MM04-W4/8-Case#4	Meeting Minutes (MM)	Jul-09 (Wave4)	Progress meeting	PDF file
MM05-W5/8-Case#4	Meeting Minutes (MM)	Nov-09 (Wave5)	Progress meeting	PDF file (Held in November13; it refers to October)*.
MM06-W6/8-Case#4	Meeting Minutes (MM)	Dec-08 (Wave6)	Progress meeting	PDF file (scanned version); With handwritten notes)
MM07-W7/8-Case#4	Meeting Minutes (MM)	Feb-09 (Wave7)	Progress meeting	PDF file
MM08-W8/8-Case#4	Meeting Minutes (MM)	Mar-09 (Wave8)	Progress meeting	PDF file
MM09-Case#4	Meeting Minutes (MM)	May-08	Project Delivery Team Meeting	Microsoft Word file
MM10-Case#4	Meeting Minutes (MM)	Feb-09	Project Delivery Team Meeting	Microsoft Word file
BP01-Case#4	Board Paper (BP)	Feb-08	Report to the Financial Planning Committee	PDF file Annex 1 Land and unit valuation Annex 2 Planning layout & elevations
CC01-Case#4	Construction Contract (CC)	Feb-08	Report to the Financial Planning Committee	PDF file
CF01-Case#4	Cash Flow Map (CF)	Not available	Cash Flow Map as issued by the client	Microsoft Excel file
PD01-Case#4	Project Team Directory (PD)	Not available	Directory of organisations members and their contact details.	Microsoft Excel file
EE01-Case#4	Email Exchange (EE)	Nov-10	Email exchange between staff member with the client and I.	Electronic format (Microsoft Outlook message). Additional clarification about the management of the project.
PI01-Case#4	Phone Interview (PI)	Mar-11	Phone interview between the project manager with the client and I regarding the maintenance of common areas.	Handwritten notes
Blyth Court (Case#5)				
MM01-W1/12-Case#5	Meeting Minutes (MM)	Apr-09 (Wave1)	Site meeting	PDF file
MM02-W2/12-Case#5	Meeting Minutes (MM)	May-09 (Wave2)	Site meeting	PDF file
MM03-W3/12-Case#5	Meeting Minutes (MM)	Jun-09 (Wave3)	Site meeting	PDF file
MM04-W4/12-Case#5	Meeting Minutes (MM)	Jul-09 (Wave4)	Site meeting	PDF file

MM05-W5/12-Case#5	Meeting Minutes (MM)	Aug-09 (Wave5)	Site meeting	PDF file
MM06-W6/12-Case#5	Meeting Minutes (MM)	Sep-09 (Wave6)	Site meeting	PDF file
MM07-W7/12-Case#5	Meeting Minutes (MM)	Oct-09 (Wave7)	Site meeting	PDF file
MM08-W8/12-Case#5	Meeting Minutes (MM)	Nov-09 (Wave8)	Site meeting	PDF file
MM09-W9/12-Case#5	Meeting Minutes (MM)	Dec-09 (Wave9)	Site meeting	PDF file
MM10-W10/12-Case#5	Meeting Minutes (MM)	Jan-10 (Wave10)	Site meeting	PDF file
MM11-W11/12-Case#5	Meeting Minutes (MM)	Feb-10 (Wave11)	Site meeting	PDF file
MM12-W12/12-Case#5	Meeting Minutes (MM)	Mar-10 (Wave12)	Site meeting	PDF file
BP01-Case#5	Board Paper (BP)	Mar-09	Report to the Financial Planning Committee	PDF file Annex 1 Site Layout Annex 2 Floor layout
CC01-Case#5	Construction Contract (CC)	Feb-09	Report to the Financial Planning Committee	PDF file
EE01-Case#5	Email Exchange (EE)	Nov-10	Email exchange between the building control officer with the local council and I.	Electronic format (Microsoft Outlook message).
EE02-Case#5	Email Exchange (EE)	Nov-10	Email exchange between the building control officer with the local council and I.	Electronic format (Microsoft Outlook). Additional clarification about planning permission.
EE03-Case#5	Email Exchange (EE)	Nov-10	Email exchange between the architect and I.	Electronic format (Microsoft Outlook).
Oakley Road (Case#6)				
MM01-W1/8-Case#6	Meeting Minutes (MM)	Jan-08 (Wave1)	Progress meeting	PDF file
MM02-W2/8-Case#6	Meeting Minutes (MM)	Feb-08 (Wave2)	Progress meeting	PDF file
MM03-W3/8-Case#6	Meeting Minutes (MM)	Apr-08 (Wave3)	Progress meeting	PDF file (Held in April, 2; it refers to March)*.
MM04-W4/8-Case#6	Meeting Minutes (MM)	May-08 (Wave4)	Progress meeting	PDF file (Held in May, 13; it refers to April)*.

MM05-W5/8-Case#6	Meeting Minutes (MM)	Jun-08 (Wave5)	Progress meeting	PDF file (Held in June, 11; it refers to May)*.
MM06-W6/8-Case#6	Meeting Minutes (MM)	Jul-08 (Wave6)	Progress meeting	PDF file (Held in July, 9; it refers to June)*.
MM07-W7/8-Case#6	Meeting Minutes (MM)	Aug-08 (Wave7)	Progress meeting	PDF file (Held in August, 13; it refers to July)*.
MM08-W8/8-Case#6	Meeting Minutes (MM)	Sep-08 (Wave8)	Progress meeting	PDF file (Held in September, 10; it refers to August)*.
BP01-Case#6	Board Paper (BP)	Dec-09	Report to the Financial Planning Committee	PDF file Annex 1 Grant appraisal Annex 2 Arial view of the site Annex 3 Project Outputs
PA01-Case#6	Planning Approvals (PA)	Nov-07	Planning Permission Application (Decision letter from the local council)	PDF file (scanned version). Document issued before project could start on site. Annex1 H.M. Land Registry.
PA02-Case#6	Planning Approvals (PA)	Feb-08	Letter from client the local council regarding discharging of planning conditions.	PDF file (scanned version)
CR01-Case#6	Contractor's Report (CR)	Dec-07	Documents sent by the main contractor. It includes a letter and an email regarding the use of an adjoining site by the main contractor during the project (to implement a restricted area for keeping supplies and machinery).	PDF file Annex 1 Proof of contractor's Liability and Contract Works Insurances Annex 2 Gantt Chart of works (scanned version) Annex 3 Letter (scanned version) between the main contractor and adjoining landlord. Annex 4 Email (scanned version) between the main contractor and the local council.
CR02-Case#6	Contractor's Report (CR)	Apr-08	Report by the main contractor to the client and their agent. (It includes information on project progress; health and safety; stage of environmental assessment; and number of lost hours	PDF file (scanned version) Annex1 Contact details for main contractor's sub-contractors

			due to inclement weather).	
CR03-Case#6	Contractor's Report (CR)	May-08	Report by the main contractor to the client and their agent. (It includes information on project progress; health and safety; stage of environmental assessment; and number of lost hours due to inclement weather).	PDF file (scanned version) Annex 1 Contact details for main contractor's sub-contractors
PA03-Case#6	Planning Approvals (PA)	Mar-08	Letter from the clients' agent to the local council suggesting the erection of a fence to stop trespasses reported as 'historic un-authorised entries'.	PDF file (scanned version) Handwritten notes where the local officer agrees to the erection of a fence.
CR04-Case#6	Contractor's Report (CR)	Jun-08	Report by the main contractor to the client and their agent. (It includes information on project progress; health and safety; stage of environmental assessment; and number of lost hours due to inclement weather).	PDF file (scanned version) Annex 1 Contact details for main contractor' sub-contractors
CR05-Case#6	Contractor's Report (CR)	Jul-08	Report by the main contractor to the client and their agent. (It includes information on project progress; health and safety; stage of environmental assessment; and number of lost hours due to inclement weather).	PDF file (scanned version) Annex 1 Contact details for main contractor' sub-contractors
CR06-Case#6	Contractor's Report (CR)	Aug-08	Report by the main contractor to the client and their agent. (It includes information on project progress; health and safety; stage of environmental assessment; and number of lost hours due to inclement weather).	PDF file (scanned version) Annex 1 Contact details for main contractor' sub-contractors
CR07-Case#6	Contractor's Report (CR)	Sep-08	Report by the main contractor to the client and their agent. (It includes information on project progress; health and safety; stage of environmental assessment; and number of lost hours	PDF file (scanned version) Annex 1 Contact details for main contractor' sub-contractors

			due to inclement weather).	
Washbrook Road (Case#7)				
MM01-W1/10-Case#7	Meeting Minutes (MM)	Apr-09 (Wave1)	Site meeting	PDF file (scanned version version)
MM02-W2/10-Case#7	Meeting Minutes (MM)	May-09 (Wave2)	Site meeting	PDF file (scanned version version)
MM03-W3/10-Case#7	Meeting Minutes (MM)	Jun-09 (Wave3)	Site meeting	PDF file (scanned version)
MM04-W4/10-Case#7	Meeting Minutes (MM)	Jul-09 (Wave4)	Site meeting	PDF file (scanned version)
MM05-W5/10-Case#7	Meeting Minutes (MM)	Aug-09 (Wave5)	Site meeting	PDF file (scanned version)
MM06-W6/10-Case#7	Meeting Minutes (MM)	Sep-09 (Wave6)	Site meeting	PDF file (scanned version)
MM07-W7/10-Case#7	Meeting Minutes (MM)	Oct-09 (Wave7)	Site meeting	PDF file (scanned version)
MM08-W8/10-Case#7	Meeting Minutes (MM)	Nov-09 (Wave8)	Site meeting	PDF file (scanned version)
MM09-W9/10-Case#7	Meeting Minutes (MM)	Dec-09 (Wave9)	Site meeting	PDF file (scanned version)
MM10-W10/10-Case#7	Meeting Minutes (MM)	Jan-10 (Wave10)	Site meeting	PDF file (scanned version)
CR01-Case#7	Contractor's Report (CR)	Apr-09	Report by the main contractor to the client and their agent. (It includes information on project progress; proposed programme dates; planning conditions and health and safety).	PDF file (scanned version). It includes contact details for sub-contractors on-site. Annex 1 Planning Conditions Action Sheet Annex 2 Gantt chart (scanned version with handwritten annotations)
PD01-Case#7	Project Team Directory (PD)	Project document	Directory of organisations and project managers' contact details.	PDF file (scanned version)
PA01-Case#7	Planning Approvals (PA)	Mar-09	Letter from the architects' practice to the local council as part of the submission of 'information to discharge the outstanding planning conditions'.	PDF file (scanned version) Annex 1 Construction drawings Annex 2 Adjoining landlords' consent to the building works Annex 3 Client's comments on construction drawings Annex4 Copy of Certificate of Employers liability Insurance (for the main contractor)

CR02-Case#7	Contractor's Report (CR)	May-09	Report by the main contractor to the client and their agent. (It includes information on project progress; proposed programme dates; planning conditions; and, cash flow).	PDF file (scanned version). With handwritten notes regarding design changes and cash flow (amends to the values).
CR02-Case#7	Contractor's Report (CR)	May-09	Report by the main contractor to the client and their agent. (It includes information on project progress; proposed programme dates; planning conditions; health and safety; and, cash flow).	PDF file (scanned version). With handwritten notes regarding design changes. Annex 1 Gantt chart (scanned version) Annex 2 Finishes schedule Annex 3 Planning Conditions Action Sheet Annex 4 Reduced Output Inspection (pictures on health and safety issues) Annex 5 e-email (scanned version) between the local police and the clients' agent
PA01-Case#7	Planning Approvals (PA)	Jun-09	Letter from the local council to the client (and return of client's cheque as the local council was not charging for discharging conditions).	PDF file (scanned version)
CR03-Case#7	Contractor's Report (CR)	Jul-09	Report by the main contractor to the client and their agent. (It includes information on project progress; proposed programme dates; planning conditions; health and safety; and, cash flow).	PDF file (scanned version). With handwritten notes regarding design changes Annex 1 Finishes schedule Annex 2 Monitor's Site Report Annex 3 Drawings; handwritten comments
PA02-Case#7	Planning Approvals (PA)	Jun-09	Letter from architects' practice to the local council regarding design changes.	PDF file (scanned version)
EC01-Case#7	Environmental Certificates (EC)	Feb-10	Individual Environmental Certificates for the plots from 1-23 (115 pages).	PDF file

[+] I indicated the meeting as noted in the minutes even through 'progress meeting' and 'site meeting' were often used interchangeable.

* The meetings were held at the end of each month. Exceptionally, these were also held in the first week of the following month. To account for this, I made sure I allocated the meeting minute to the month that it reported on instead of the month that the meeting was held.

Appendix 1.7 Academic Conferences and Trade Fairs

Event Details	Audience Profile	Impact on My Research
Academic Conferences*		
Lecture Series on Innovation, Imperial College Business School (in various occasions)	Leading researchers and practitioners in the areas of innovation (e.g. Chairman of the Olympic Delivery Authority)	I learnt about a diversity of topics relating to innovation from researchers and practitioners. I highlight the lecture by Sir John Armitt, Chairman of the Olympic Delivery Authority, on lessons about building the 2012 Olympic site.
Lecture Series on Strategy and Entrepreneurship, London Business School (in various occasions)	Leading researchers in the areas of strategy and entrepreneurship	Discussions on various methodological and theoretical approaches within strategy. This was important in the early stages of my research.
5th Workshop on Trust within and between Organisations. EIASM – European Institute for Advanced Studies in Management, 2010, Spain.	Researchers working on trust from different methodological and theoretical traditions	One of my early opportunities to present my ideas outside of the LSE as I was making sense of my readings of research on inter-organisational relationships and trust – my first research interest.
Sumantra Ghoshal Conference on Managerially Relevant Research, London Business School, 2010, UK	Leading researchers on strategy and organisational theory	Opportunity to attend a showcase of research 'in progress' within strategy. I highlight works using multiple case-study research design and social capital theory.
Student presentations at the EROB and ISIG Department of Management, LSE	Fellow PhD students from different methodological and theoretical traditions within management	It was a 'safe harbour' to present and develop my research. Fellow students and faculty helped me to mature ideas. They also shared wisdom about conducting and communicating original research.
PhD Poster Day at the LSE (2010 and 2011)	Fellow PhD students across social sciences at various stages of their research and community outside of the LSE	Showcase of my research outside the LSE community. I recall the encouragement given by a strategy consultant about my multimedia visualisation (first tried in 2011) of dynamic inter-organisational relationships.
PhD Day at the University of Reading, 2010, UK	Fellow PhD students focusing on the various aspects of construction management and engineering	I learnt tips on conducting research within the building industry (often an 'outsider' setting for management research). For instance, the importance of referrals to access potential interviewees.
Construction Matter – Managing complexities, decisions and actions in the building process. CBS - Copenhagen Business School, Copenhagen, 2010, Denmark.	Europe-based researchers studying the building industry from an organisational studies perspective	One of my early presentations to researchers specialised in the building industry – mostly across Europe.
First oikos Young Scholars Entrepreneurship Academy. Urnäsch, 2010, Switzerland	Fellow PhD students working across various areas related to environmental sustainability	I presented some preliminary insights from interviews and meeting minutes (at that time, for a couple of cases only) concerning environmentally sustainable construction. It was an opportunity to discuss environmental sustainability across fields of research.

INFORMS 2010 Annual Meeting. Austin, Texas, 2010, USA	College of Organization Science	My first presentation on the use of meeting minutes to study dynamic inter-organisational relationships.
Fifth Annual Mid-Atlantic Strategy Colloquium (MASC 5), University of Maryland Smith School of Business, 2011, USA	USA-based researchers from different areas of strategy and entrepreneurship	Advice on my research design using multiple case-study research and social network analysis - SNA (this currently is a working paper). I also received practical advice on doing and publishing my research.
SUNBELT XXXI Social Networks Conference, 2011, USA	Researchers on social networks from various method and theoretical traditions. Showcase of research using SNA across various disciplines	One of the most import venues for me to mature my ideas on the development of an in-depth approach to social networks. Methodology-related advice from 'users'[1] of SNA techniques.
LSE-Dauphine Doctoral Workshop, 2011, France	PhD students and experienced researchers in organisational studies	I had the opportunity to receive feedback on the use of meeting minutes as a data source on inter-organisational relationships and it linkages to other theoretical traditions within organisational studies
27th EGOS Doctoral Workshop and **Colloquium**, 2011, Sweden	Fellow PhD students and experienced researchers	I learnt several tips on qualitative research from the fellow PhD students. My participations on the conference track focused on the trust allowed me to strengthen my work on trust.
OMT/MOC Doctoral Consortium, Academy of Management (AoM), 2011, USA.	Fellow PhD students and experienced researchers	I had the opportunity to discuss preliminary analyses of my data (I could build on the feedback received at the EGOS Colloquium). I was pointed out directions for strengthening my research and theoretical contribution on coordination of inter-organisational relationships.
4th Conference on Management & Social Networks, Université de Genève, 2012, Switzerland	Researchers on social networks from various method and theoretical traditions	I received feedback on my approach to SNA using meeting minutes from a coordination perspective. I received feedback on my novel approach to SNA from experienced researchers.
Trade Events*		
Willmot Dixon Education Sector, Surrey Sports Centre, 2010, UK	Architects' practice, local councils, and education institutions	Expanded my network of contacts within the building industry. Recruitment of interviewees
SDRN Annual Sustainable Development Research Conference, 2010, London	Various stakeholders engaged in environmental sustainable construction	Understanding of the current debates in the building industry concerning challenges of environmental sustainable construction.
ECOBUILD, years of 2009, 2010, and 2011, UK	A wide range of international organisations working across the building industry	Recruitment of interviewees. Talks about the building industry in the UK and elsewhere. I had the opportunity to observe the launch of new building technologies and techniques over the past few years.
NLA/CABE breakfast seminar 'Simpler and Better - Housing design in everyone's interest', 2011, UK	Architects' practices, local councils and housing associations	A practitioner's perspective on challenges and further directions for action concerning England's housing sector.

* The listing is organised chronologically for better reflecting the impact throughput my research journey leading to the present version of the study.

[1] I say 'users' intentionally. This aims to denote 'tried and true' SNA techniques as opposed to new ones.

Appendix 1.8 Inter-Rater Agreement in Codding Text-Based Social Network Data

***** This content has been removed by the request of the author *****

Appendix 1.9 Illustration of Extraction of Social Network Data from Text

***** This content has been removed by the request of the author *****

Appendix 1.10 LSE Research Ethics Checklist

RESEARCH ETHICS REVIEW CHECKLIST

This checklist must be completed before potential participants are approached to take part in any research.

Section I: Applicant Details

Name of researcher:	NUNO OLIVEIRA
Status(delete as appropriate):	Undergraduate Student/MSc Student/PhD Student/Staff
Email address:	N.R.OLIVEIRA@LSE.AC.UK
Contact address:	HOUGHT STREET WC2A 2AE
Telephone number:	07517477721

Section II: Project Details

Title of the proposal and brief abstract: INTER-FIRM NETWORS: THE INTANGIBLE ELEMENT IN BUILDING PROJECTS

Section III: Student Details:

Details of study:	
Supervisor's name:	DR NATHALIE MITEV
Email address:	N.N.MITEV@LSE.AC.UK
Contact address:	02079556029

Section IV: Research Checklist

Consent

	Yes	**No**	**Not certain**
Does the study involve participants who are in any way vulnerable or may have any difficulty giving consent? *If you have answered yes or are not certain about this please complete Section 1 of the Research Questionnaire.* *As general guidance, the Research Ethics Committee feels that research participants under the age of 18 may be vulnerable.*		X	
Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g. covert observation of people in public places) *If you have answered yes or are not certain about this please complete Section 1 of the Research Questionnaire.*		X	

Research Design/Methodology

Does the research methodology use deception? *If you have*			

answered yes or are not certain about this please complete Section 2 of the Research Questionnaire.		X	
Are there any significant concerns regarding the design of the research project? a) If the proposed research relates to the provision of social or human services is it feasible and/or appropriate that service users or service user representatives should be in some way involved in or consulted upon the development of the project? b) Does the project involve the handling of any sensitive information? *If you have answered yes or not certain to these questions please complete Section 3 of the Research Questionnaire.*	X X		X

Financial Incentives/Sponsorship

Will the independence of the research be affected by the source of the funding? *If you have answered yes or not certain about this please complete Section 4 of the Research Questionnaire.*		X	
Are there payments to researchers/participants that may have an impact on the objectivity of the research? *If you have answered yes or not certain about this please complete Section 4 of the Research Questionnaire.*		X	
Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants? *If you have answered yes or not certain about this please complete Section 4 of the Research Questionnaire.*		X	

Research Subjects

Is pain or more than mild discomfort likely to result from the study? *If you have answered yes or not certain about this please complete Section 5 of the Research Questionnaire.*		X	
Could the study induce unacceptable psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life? Will the study involve prolonged or repetitive testing? *If you have answered yes or not certain about this please complete Section 5 of the Research Questionnaire.*		X	
Are drugs, placebos or other substances to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind? *If you have answered yes or not certain about this please complete Section 5 of the Research Questionnaire.*		X	

Risk to Researchers

Do you have any doubts or concerns regarding your (or			

your colleagues) physical or psychological wellbeing during the research period? *If you have answered yes or not certain about this please complete Section 6 of the Research Questionnaire.*		X	

Confidentiality

Do you or your supervisor have any concerns regarding confidentiality, privacy or data protection? *If you have answered yes or not certain about this please complete Section 7 of the Research Questionnaire.*		X	

Dissemination

Are there any particular groups who are likely to be harmed by dissemination of the results of this project? *If you have answered yes or not certain about this please complete Section 8 of the Research Questionnaire.*		X	

Academic Research Staff

Principal Investigator Signature:
Date:

Undergraduate/MSc Student/PhD Student

Student Signature:
Student Name (Please print): NUNO OLIVEIRA
Department: DoM Department of Management
Date:
Date of Research Ethics Seminar attended:

Summary of any ethical issues identified:
Supervisor Signature*:
Supervisor Name (Please print): MITEV, NATHALIE
Department: ISIG - INFORMATION SYSTEMS AND INNOVATION GROUP
Date:

* By signing this document the student supervisor attests to the fact that any ethical issues raised have been dealt with adequately.

Appendix 2.1 Calculation of the Multidimensional Measure of Consequences of Coordination

The aim of this appendix is twofold: to explain the calculation procedure; and to assuage any bias concerns.

The baseline information is the set of 4 dimensions for the multidimensional measure of consequences of coordination in inter-organisational relationships: (1) 'on time and under budget'; (2) building certification; (3) environmental sustainability standards; and, (4) defaults to the building. These four dimensions had been informed by a content analysis of meeting minutes and projects reports. The dimension of 'on time and budget' was decomposed into two indicators: delays to project and over-budget costs. The unit of measure is as following: number of weeks and British Sterling Pound (£), respectively. I gathered this information from project-related documentation. Additionally, I confirmed the information with the project manager for each project. The 'building certification' was a count of the number of certifications issued for each social housing project. 'Environmental sustainability standards' were operationalised as a *level* of environmental sustainability as issued by the CfSH and BRE Eco-homes certificates. These certificates classify the building in various *levels*. For instance, CfSH ranges from 1 to 6, where 6 is the highest level of environmental sustainability. Finally, information for the variable 'defaults to the building' was gathered from meeting minutes and project reports. This variable was operationalised as an inventory of defaults that affected the aesthetics and maintenance costs of the building (after hand-over to the client).

Weighting of the each of the four dimensions was carried out. For each case, I weighted the indicators used across the four dimension of the measure for consequences of coordination. Consider the indicator *delays*. First, I computed the total number of weeks of delays across the 7 projects. Second, I worked out the proportion of the delay in each project in relation to the total of the 7 projects. Finally, the proportion was converted into the weighting factor **(Table A).**

Table A Weighting of Factors

	Delays		**Over-Budget**		**Building Certs**		**Env. Sus. Standard***		**Overall**
	Value	Weight	Value	Weight	Value	Weight	*Level*	Weight	
Dale Lane Road (Case#1)	3 Weeks	0.30	£0	0.00	3	0.11	3	0.14	-0.05
Fulmar Road (Case#2)	3 Weeks	0.30	£17,000	0.10	5	0.19	3	0.14	-0.08
North Wingfield (Case#3)	2 weeks	0.20	£155,000	0.89	4	0.15	4	0.18	-0.76
Rowlett Road (Case#4)	On time	0.00	£0	0.00	3	0.11	3	0.14	0.25
Blyth Court (Case#5)	2 weeks	0.20	£0	0.00	4	0.15	3	0.14	0.08
Oakley Road (Case#6)	On time	0.00	£13000	0.01	4	0.15	3	0.14	0.28
Washbrook Road (Case#7)	On time	0.00	£0	0.00	4	0.15	3	0.14	0.28
Total	**10 weeks**	**1**	**£173300**	**1**	**27**	**1**	**22**	**1**	

* The CfSH and BRE Eco-homes certification are comparable.

In the following step, correction factors were considered to assuage bias concerns. Specifically, I considered two factors. *Correction factor 1* corrected for the number of weeks of delay in the project in relation to the forecasted completion time. *Correction factor 2* adjusted the over-budget costs (measured in £) to forecasted building costs (as at the start of project). I computed a proportion of the over-budget costs in relation to the total building costs. Altogether, these two correction factors reduced skewedness influenced by project's total building costs (*correction factor 1*) and length of the completion time (*correction factor 2*). Having weighted these two factors, an overall score was reached, as shown in **Table B**.

Table B Measure of Inter-Organisational Relationships

	Factor 1	***Factor 2***	**Overall**	***Z-scores***		**Score**
Dale Lane Road (Case#1)	0.21	0	0.46	0.12	< 0.15 *Z-Score*	**Low**
Fulmar Road (Case#2)	0.11	0.01	0.44	0.38	> 0.15 *Z-Score*	**Medium**
North Wingfield (Case#3)	0.08	0.05	0.46	0.10	< 0.15 *Z-Score*	**Low**
Rowlett Road (Case#4)	0	0	0.25	2.31	> 1 *Z-Score*	**High**
Blyth Court (Case#5)	0.17	0	0.45	0.23	> 0.15 *Z-Score*	**Medium**
Oakley Road (Case#6)	0	0.01	0.29	1.92	> 1 *Z-Score*	**High**
Washbrook Road (Case#7)	0	0	0.28	1.93	> 1 *Z-Score*	**High**

For clarity' sake in conveying the findings, I computed an overall score of the multidimensional indicator of consequences of coordination that entailed three levels: *high*; *medium*; and *lo*w. I defined these three levels in the following way.

First, I compute the *z-scores* on this multidimensional indicator for all 7 cases. *Z-scores* assess the variation of a given variable (e.g. number of weeks of delay) in relation to its average measure in units of standard deviations (SD). The higher it is the *z-score* the greater the consequences of coordination. A score of *high* denotes cases where the consequences of coordination among organisations lead to fully achieve the purpose. For instance, it refers to whether the project was delivered on time and at no extra costs to the client. In contrast, a score of *low* refers to cases where coordination was marginally achieved resulting in over-budget costs transferred to the client and delays in the project hand-over.

The highest *z-score* was found in Rowlett Road (Case#4) while the lowest *z-score* was registered in Dale Lane (Case#1). Finally, I defined a threshold of three levels: *low* if *z-score* < 0.15; *medium* if *z-score* > 0.15; and *high* if *z-score* > 1. I think these are fairly reasonable thresholds. More so, if one considers that the function of those is to simplify data presentation only and not producing any actual.

Overall assessment of the measure was satisfactory in terms of reliability and it captured the industry context. As far as biases are concerned, I consider that the measure was robust. Additionally, I gathered qualitative assessments about the attainment of inter-organisational relationships coordination. The combination of discrete measures with qualitative assessments was advantageous because it provided additional information that could not have been measured.

Appendix 3.1 Measures of Density and Hierarchy in Inter-Organisational Relationships

***** This content has been removed by the request of the author *****

Appendix 3.2 Calculation and Interpretation of the Measure of *Variation: Z-scores*

In this appendix, I explain the calculation and the interpretation of *z-scores* which I used to study *variation*. Given the longitudinal nature of this study, I felt the need to follow a standard procedure of representing the *variation* of variables. Moreover, there was requirement to standardise the values in order to prevent bias in the interpretation. Bias could have occurred if I had studied *variation* in terms of proportions wherein the *total* fluctuates over time (and therefore affects proportionality). I addressed this problem by using *z-scores*.

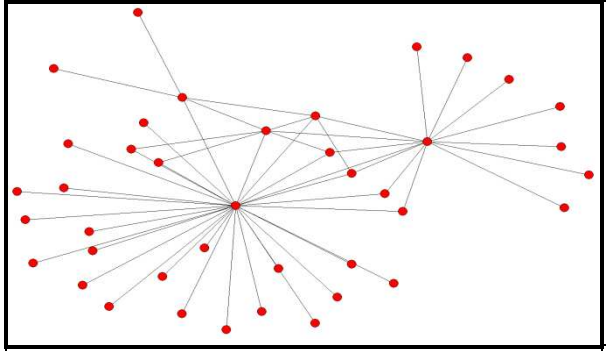
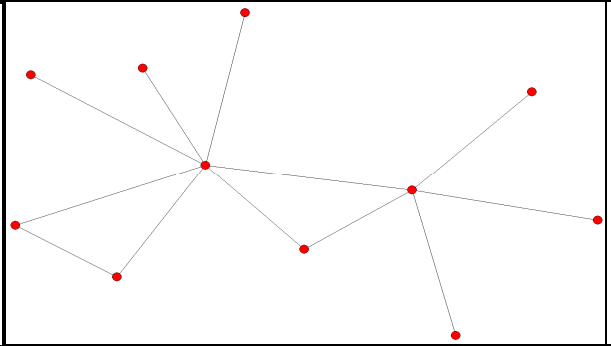
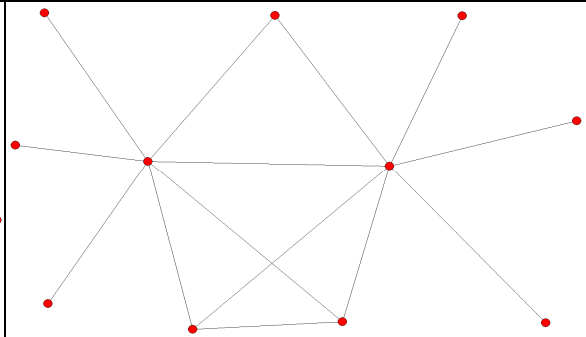
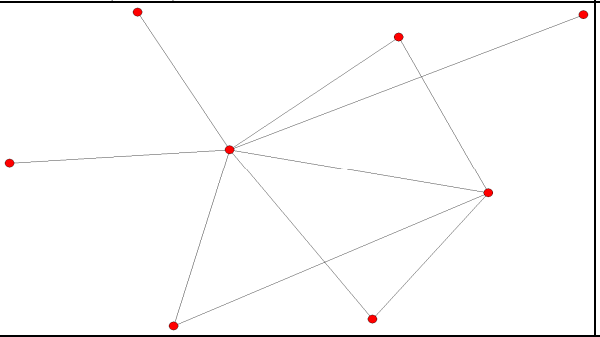
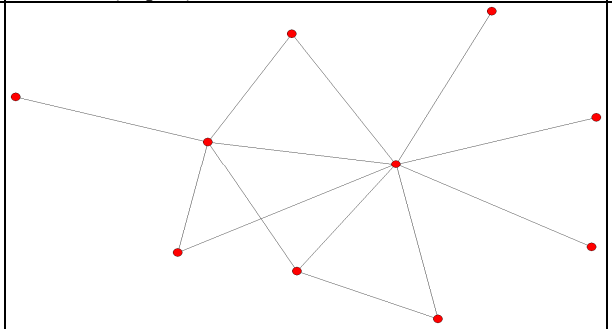
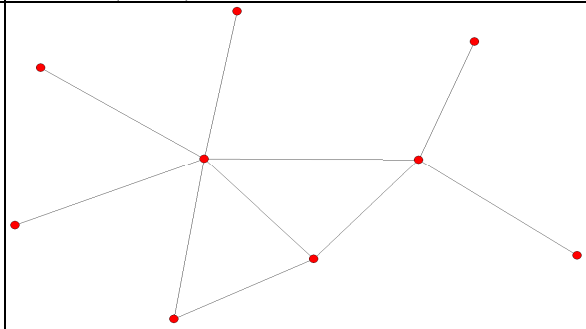
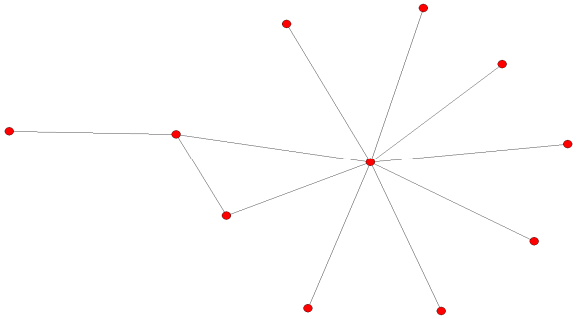
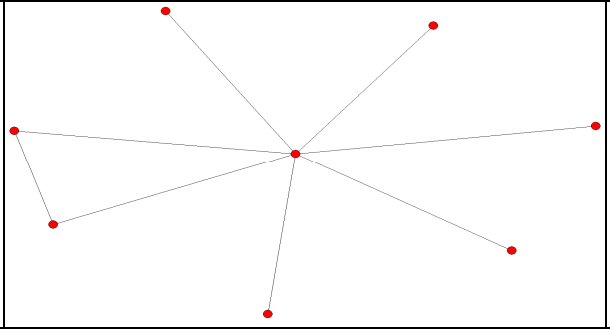
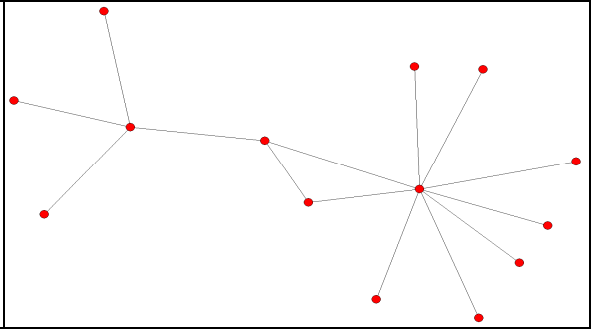
Z-scores are used to measure *variation* of a given variable away from the average (μ: mean); the unit used is standard deviation (σ: SD). A *z-score* is given by,

$$Z - Score = \frac{(x - \mu)}{\sigma}$$

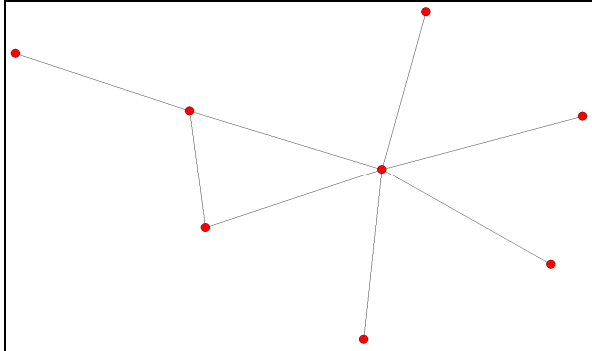
Where x is the value for a given variable, μ the average and σ the standard deviation for x variable. *Z-scores* proved adequate to study *variation* as opposed to comparing absolute measures which are sensitive to two elements: (1) size of the configuration of inter-organisational relationships – i.e. the number of organisations; and (2) number of ties within the configuration of inter-organisational relationships.

As for interpretation, consider a *Z-Score* of .02 for network density in January 2010 (Wave 1). This figure shows that the network density for January 2010 is .02 standard deviations higher than the average density for the entire configuration of inter-organizational relationships.

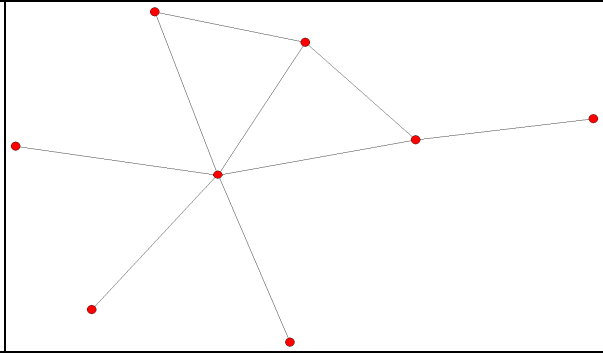
Appendix 3.3 Graphic Representation of the Structure of Dynamic Inter-Organisational Networks

Case#1 Dale Lane		
Entire Configuration	**Wave #1** (Apr08)	**Wave #2** (May08)
		
Wave #3 (Jul08)	**Wave #4** (Sep08)	**Wave #5** (Oct08)
		
Wave #6 (Nov08)	**Wave #7** (Dec08	**Wave #8** (Jan09)
		

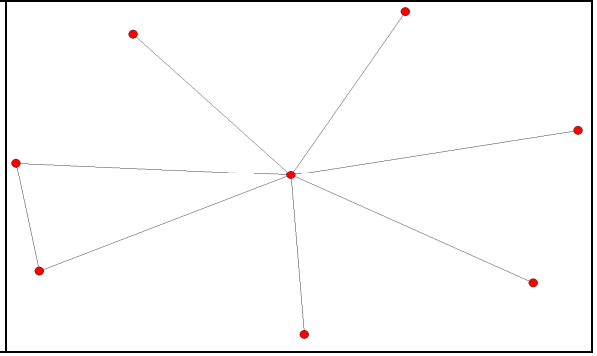
Wave #9 (Feb09)



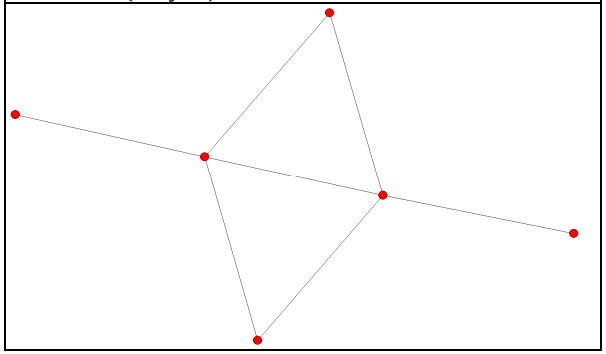
Wave #10 (Mar09)

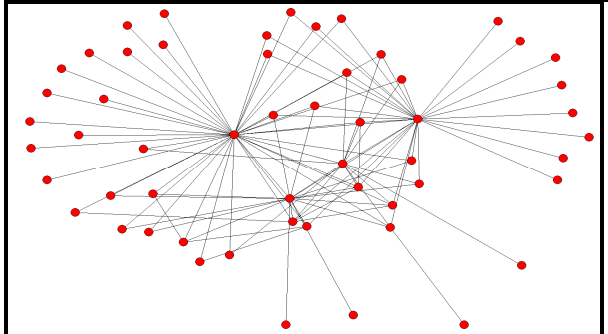
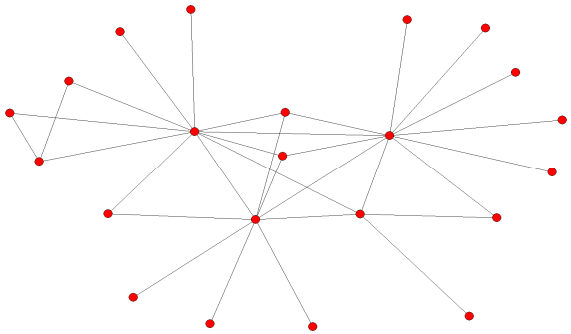
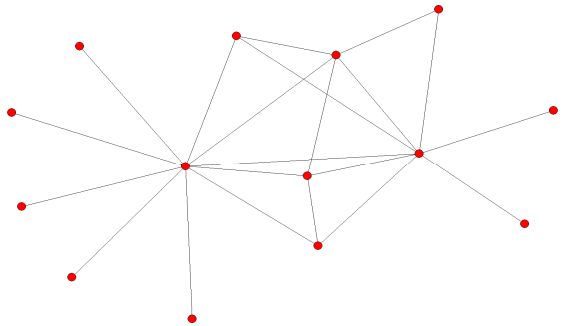
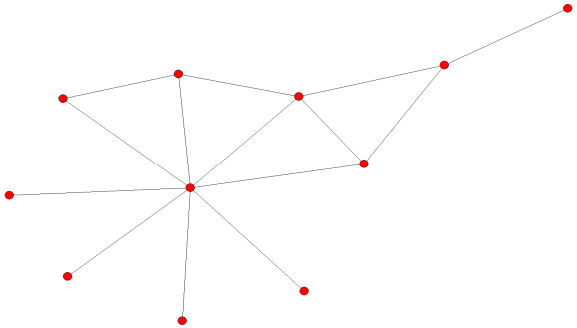
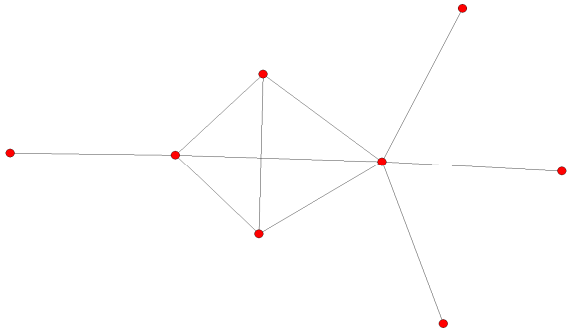
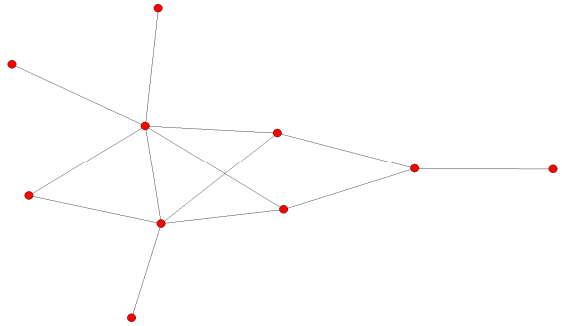
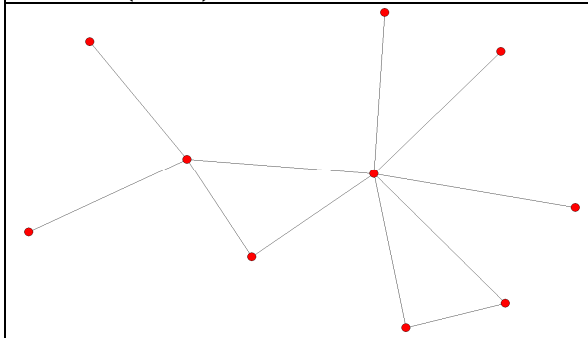
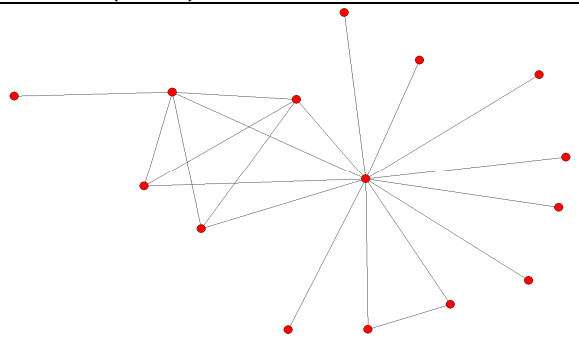
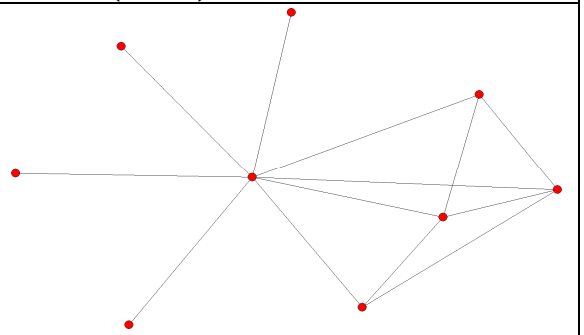


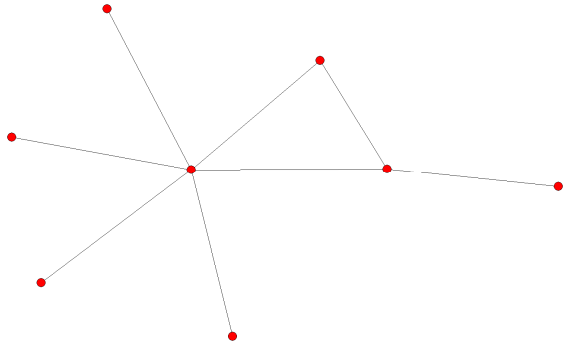
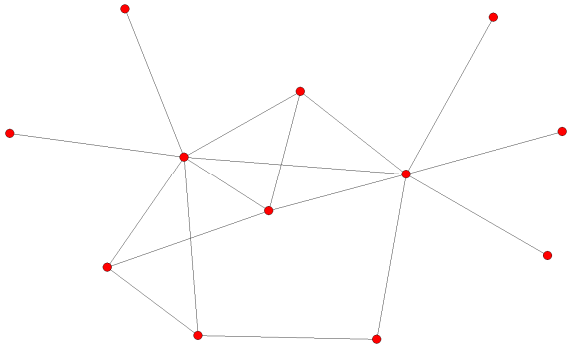
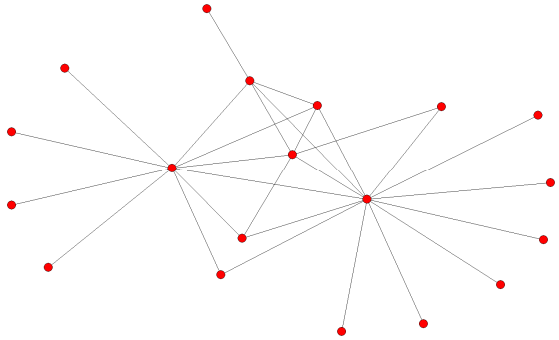
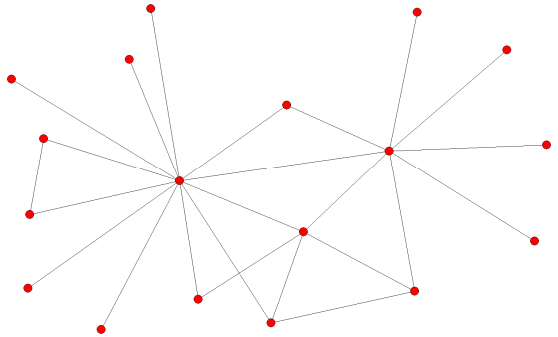
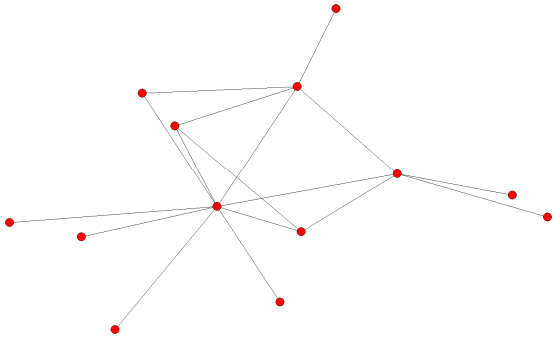
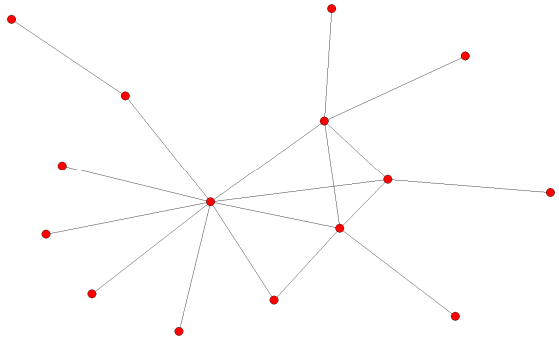
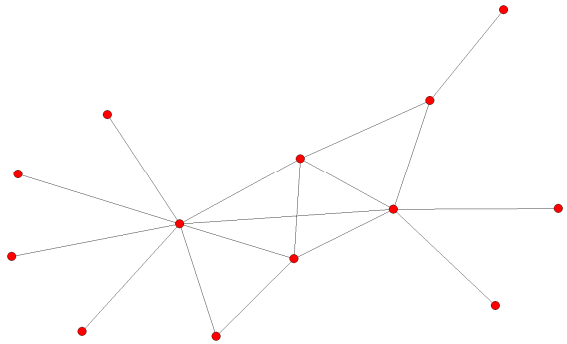
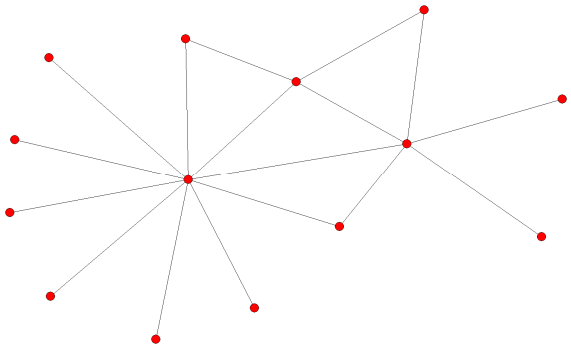
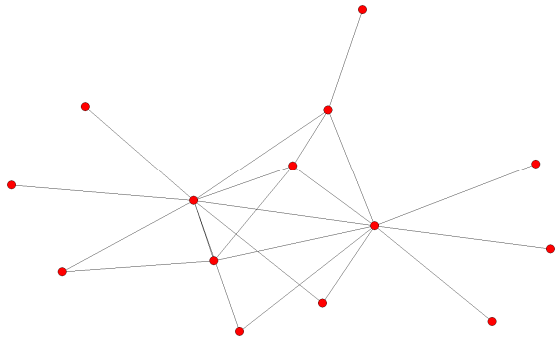
Wave #11 (Apr09)

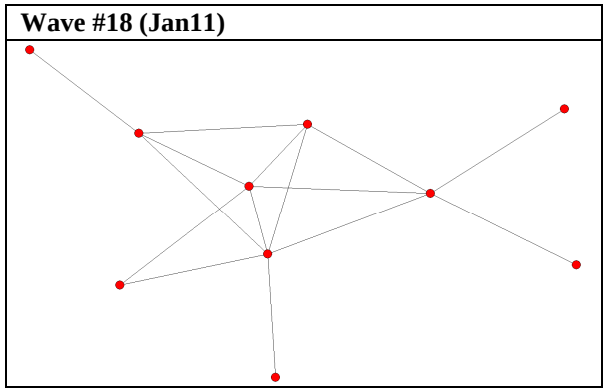


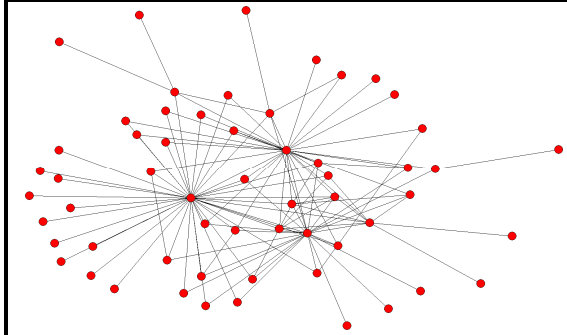
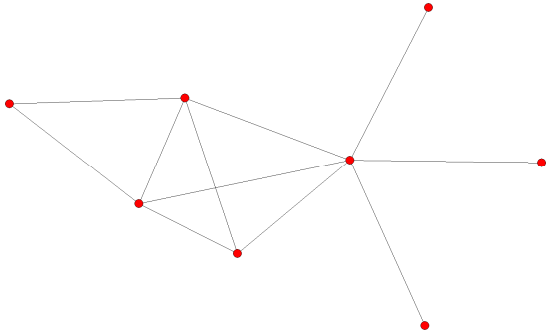
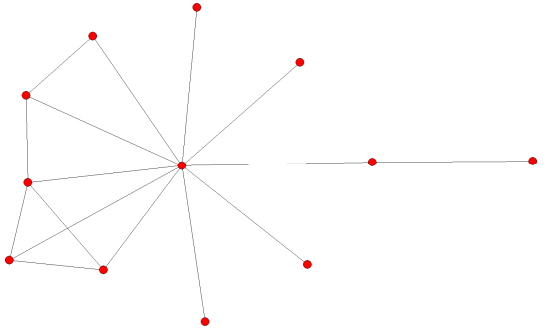
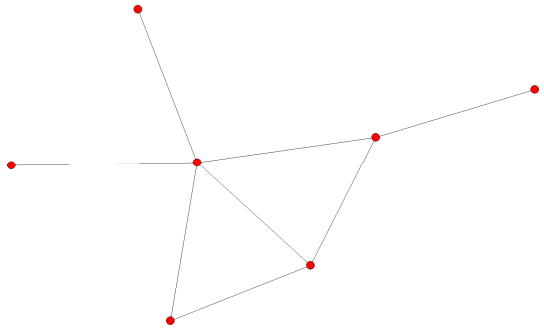
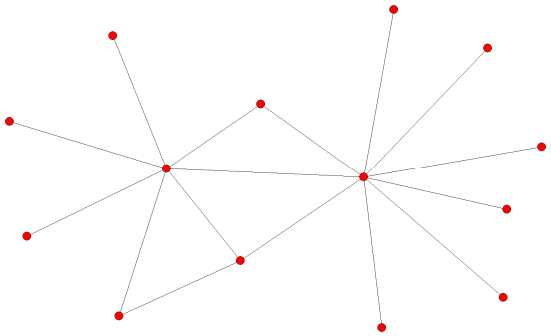
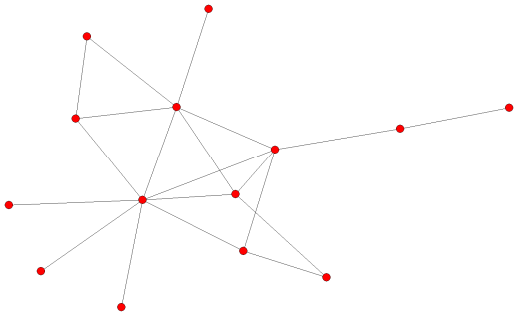
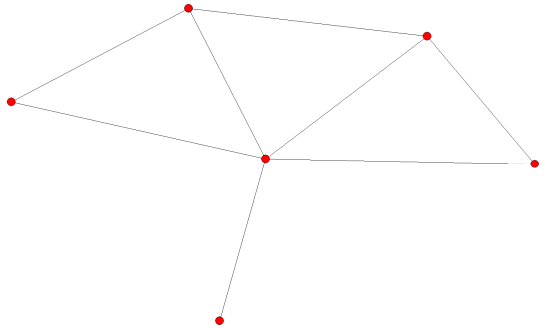
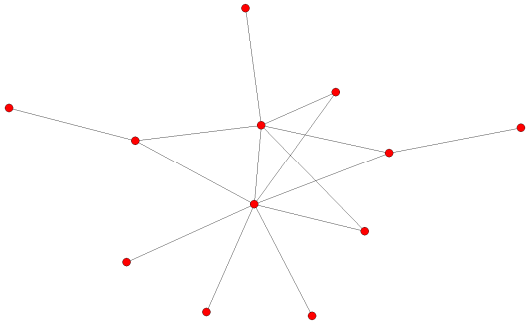
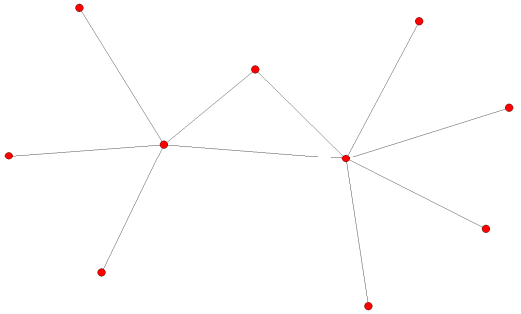
Wave #12 (May09)

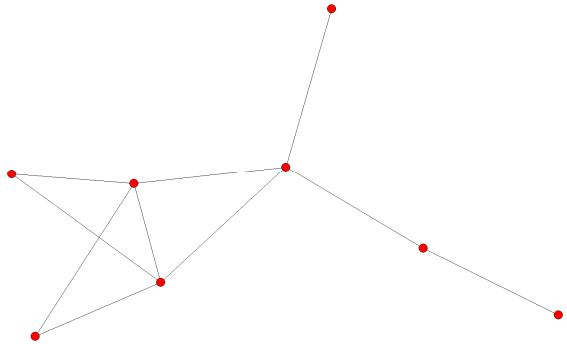
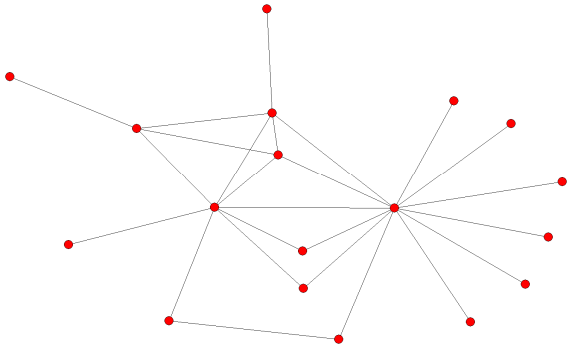
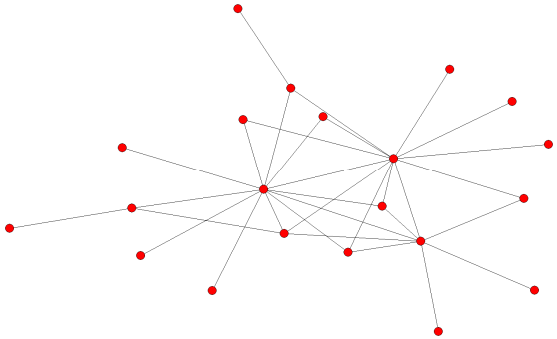
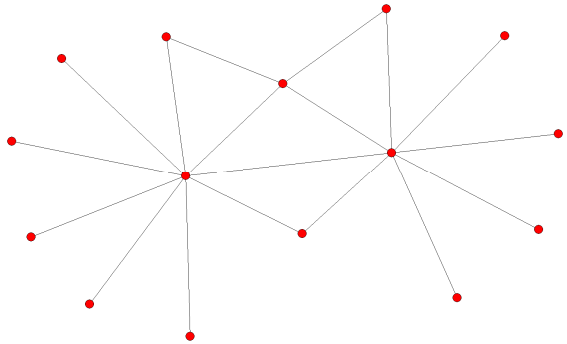
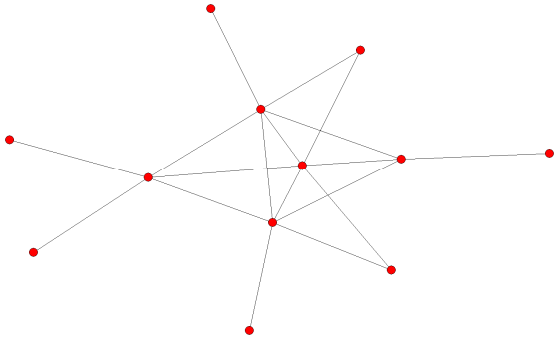
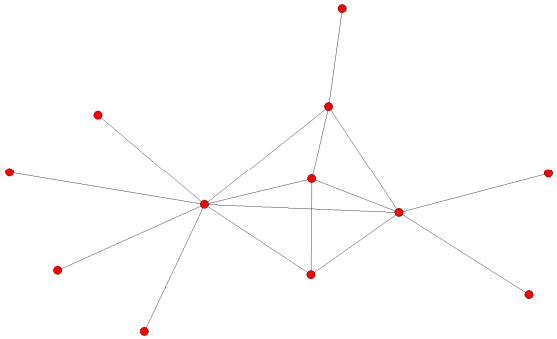
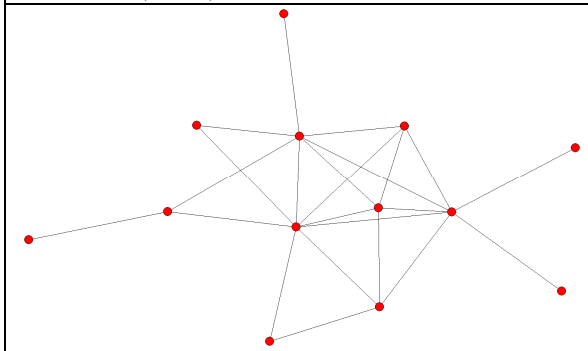
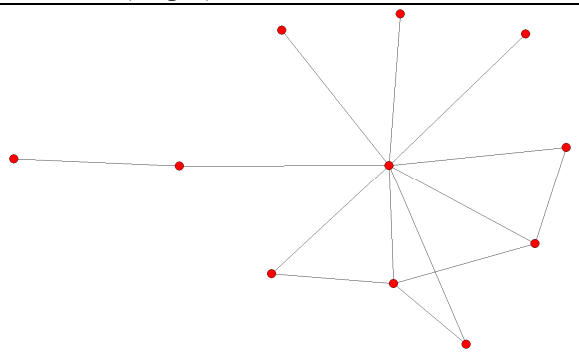
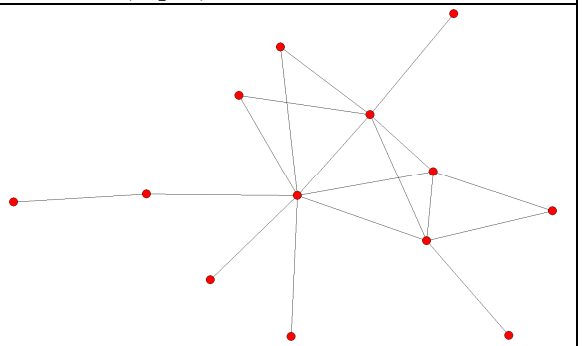


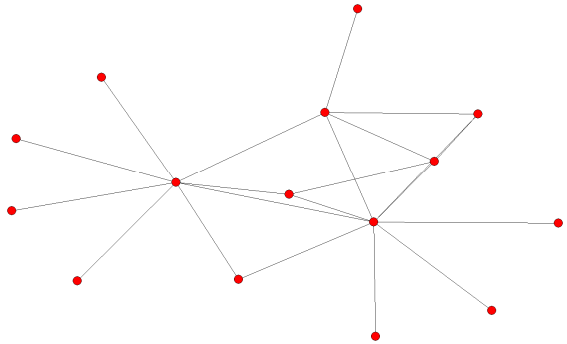
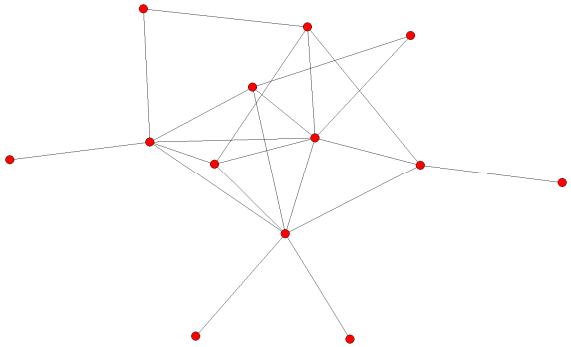
Case#2 Fulmar Road		
Entire Configuration	**Wave #1 (Jun09)**	**Wave #2 (Jul09)**
		
Wave #3 (Aug09)	**Wave #4 (Nov09)**	**Wave #5 (Dec09)**
		
Wave #6 (Jan10)	**Wave #7 (Feb10)**	**Wave #8 (Mar10)**
		

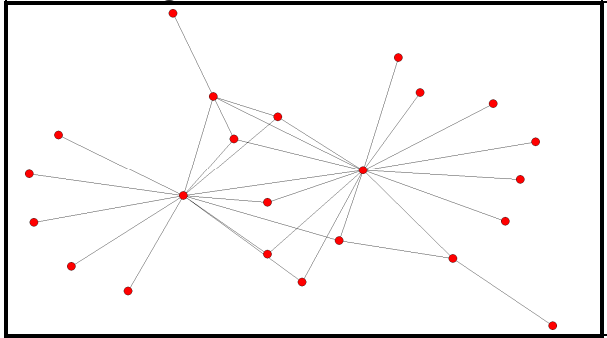
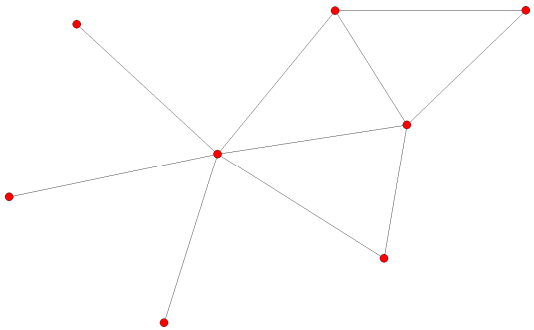
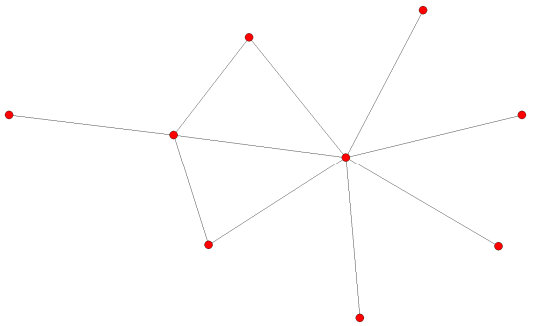
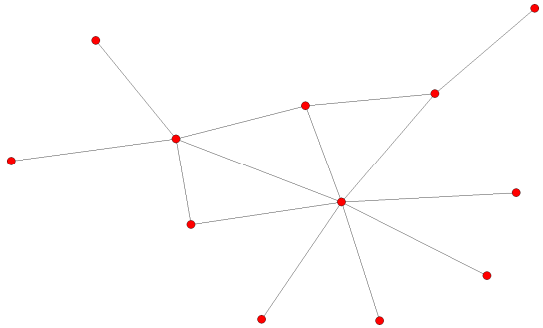
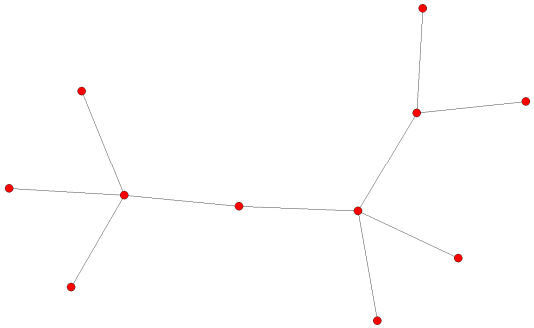
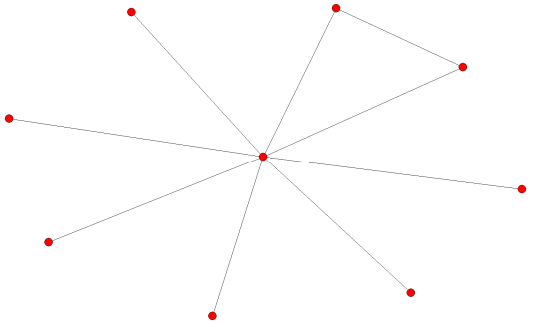
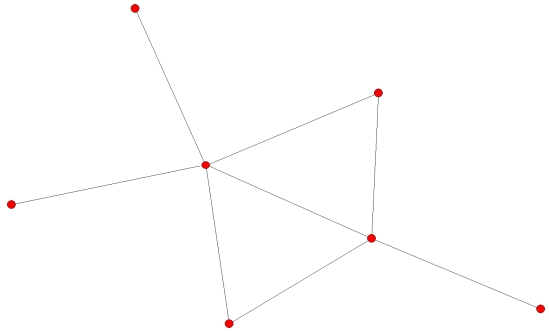
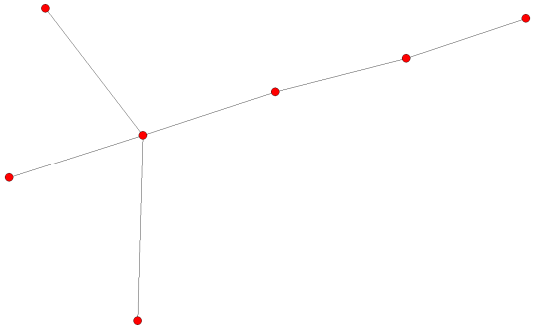
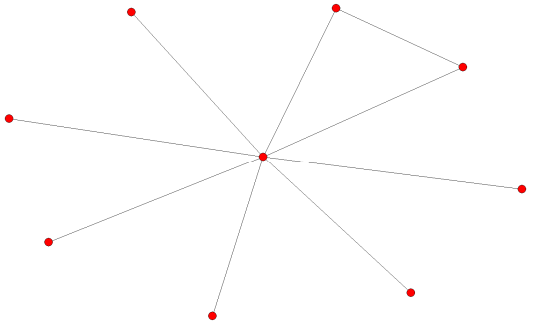
Wave #9 (Apr10)	Wave #10 (May10)	Wave #11 (Jun10)
		
Wave #12 (Jul10)	**Wave #13 (Aug10)**	**Wave #14 (Sep10)**
		
Wave #15 (Oct10)	**Wave #16 (Nov10)**	**Wave #17 (Dec10)**
		


Wave #18 (Jan11)

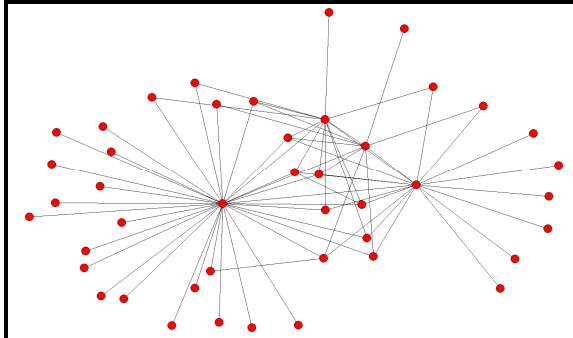
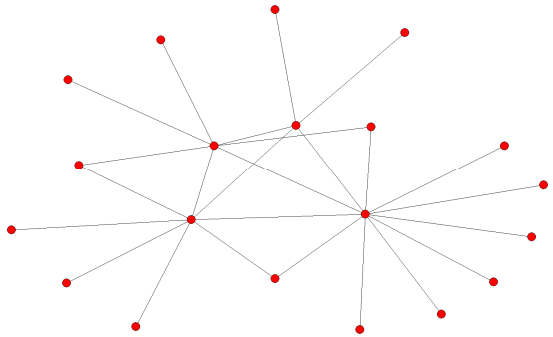
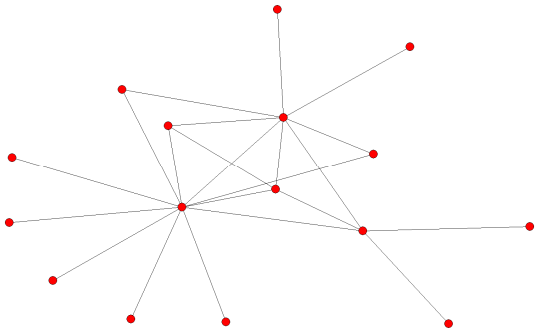
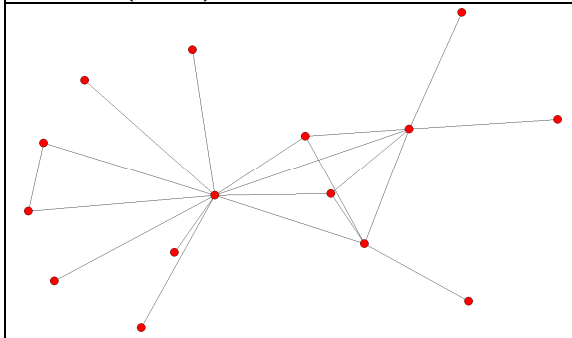
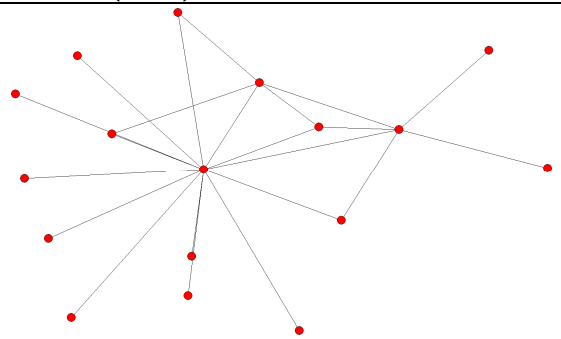
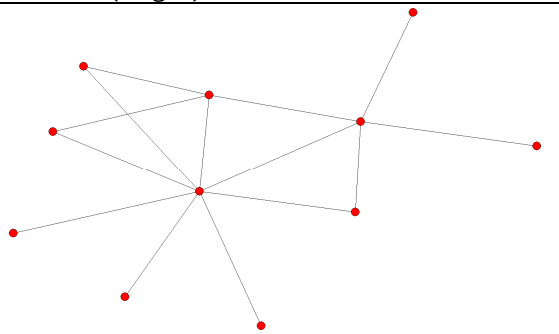
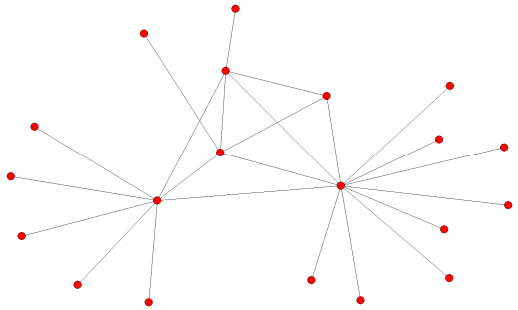
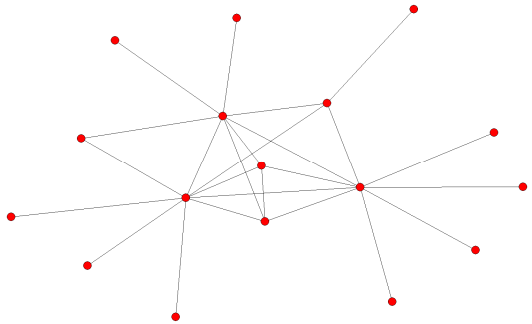
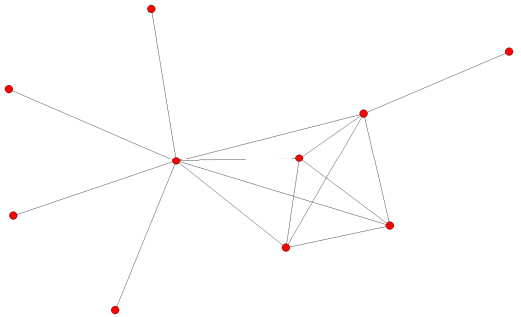
Case#3 Northwingfield Road		
Entire Configuration	**Wave #1 (Jan08)**	**Wave #2 (Feb08)**
		
Wave #3 (Mar08)	**Wave #4 (Jun08)**	**Wave #5 (Aug08)**
		
Wave #6 (Sep08)	**Wave #7 (Nov08)**	**Wave #8 (Dec08)**
		

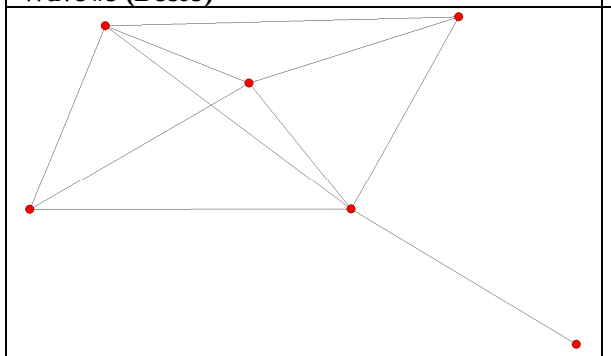
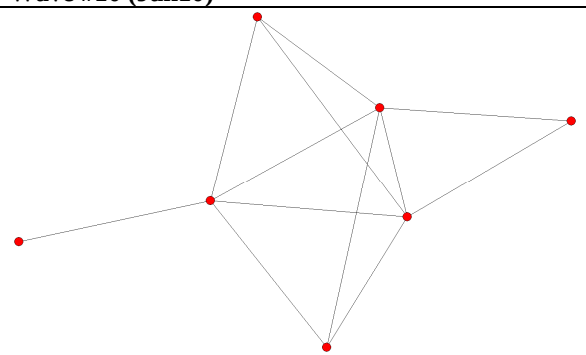
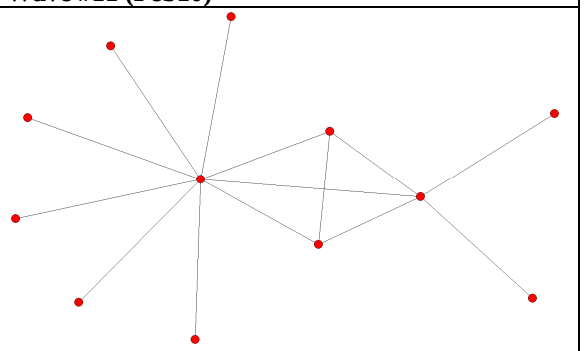
Wave #9 (Jan09)	Wave #10 (Feb09)	Wave #11 (Mar09)
		
Wave #12 (Apr09)	**Wave #13 (May09)**	**Wave #14 (Jun09)**
		
Wave #15 (Jul09)	**Wave #16 (Aug09)**	**Wave #17 (Sep09)**
		

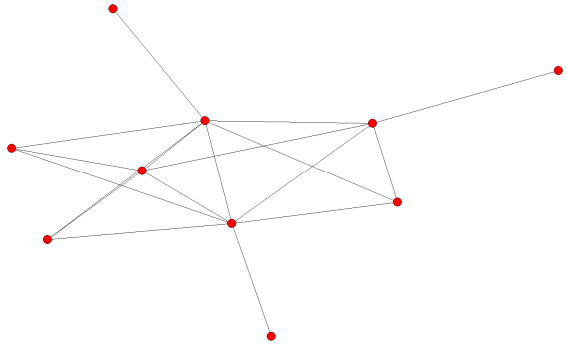
Wave #18 (Oct09)	Wave #19 (Dec09)
	

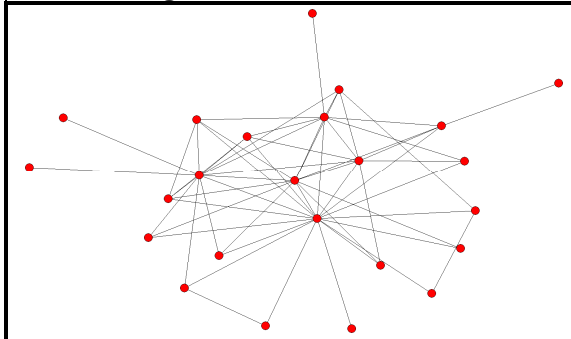
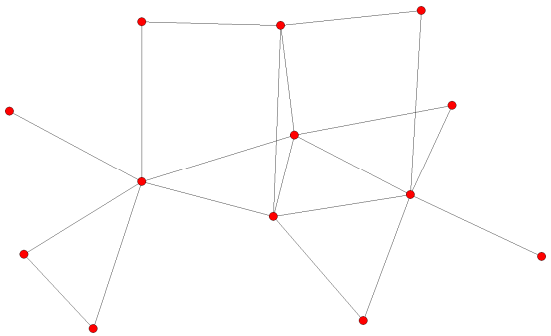
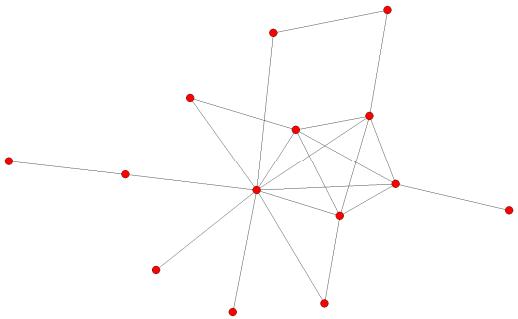
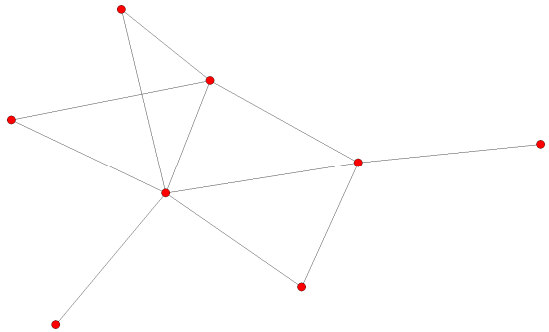
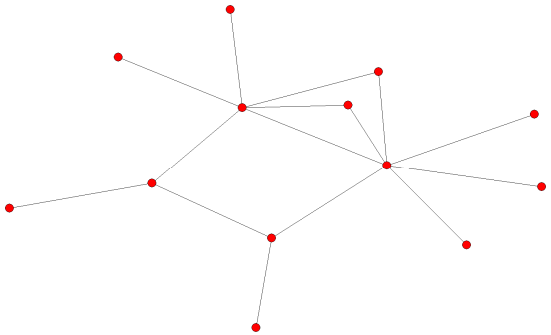
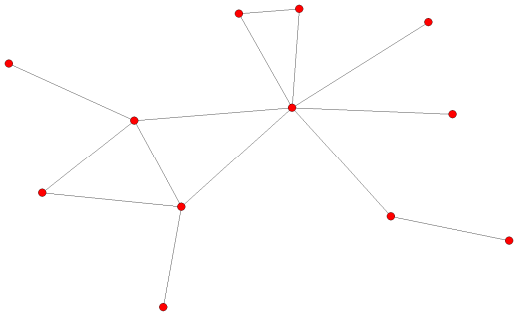
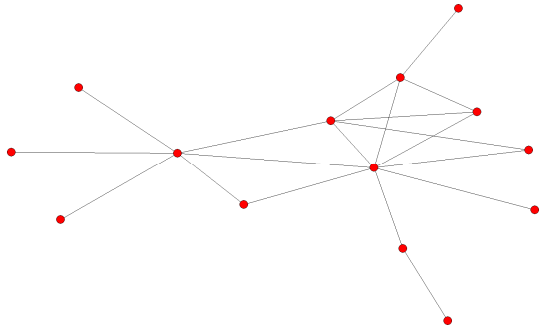
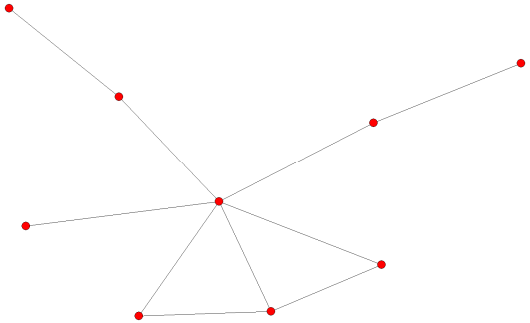
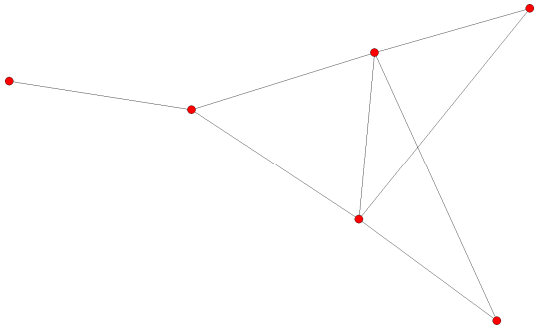
Case#4 - Rowlett Road		
Entire Configuration	**Wave #1 (Mar08)**	**Wave #2 (May08)**
		
Wave #3 (Jul08)	**Wave #4 (Oct08)**	**Wave #5 (Jan09)**
		
Wave #6 (Feb09)	**Wave #7 (Mar09)**	**Wave #8 (Apr09)**
		

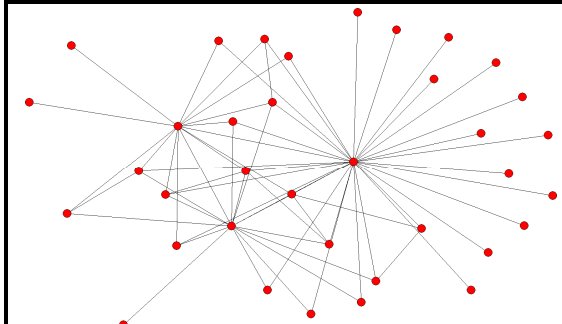
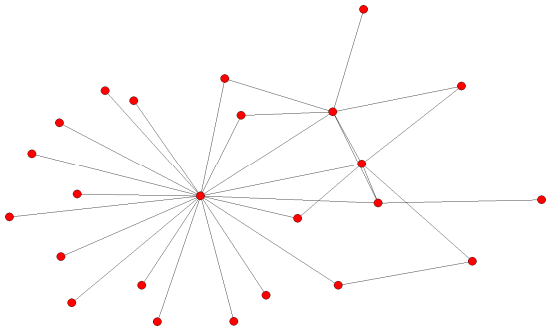
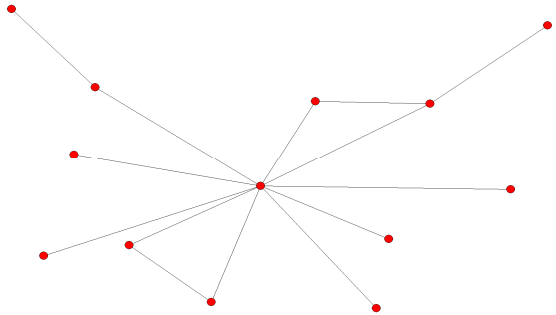
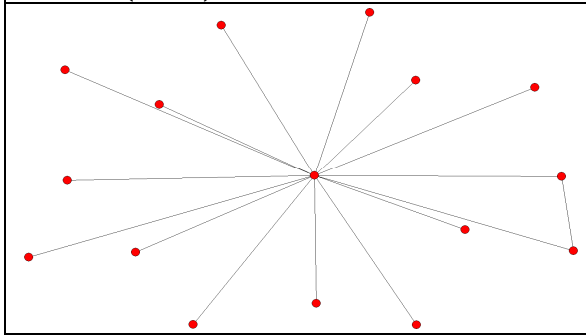
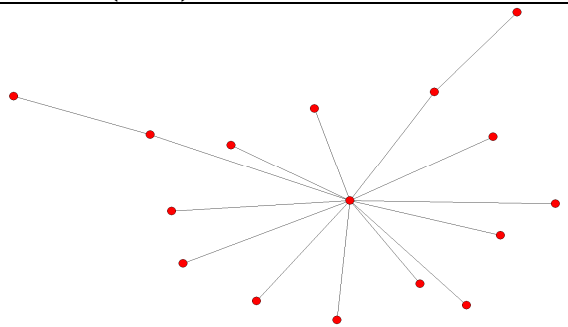
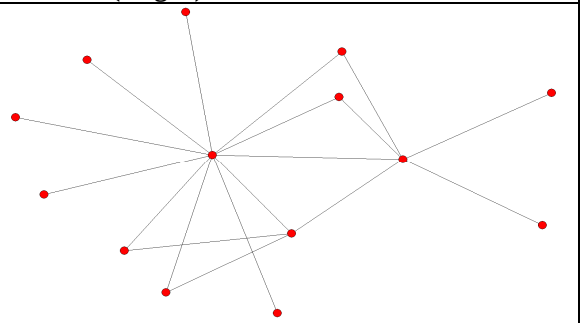
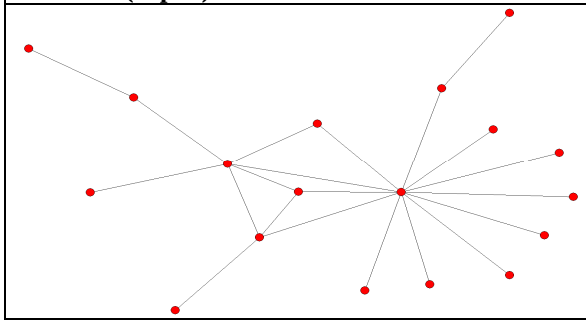
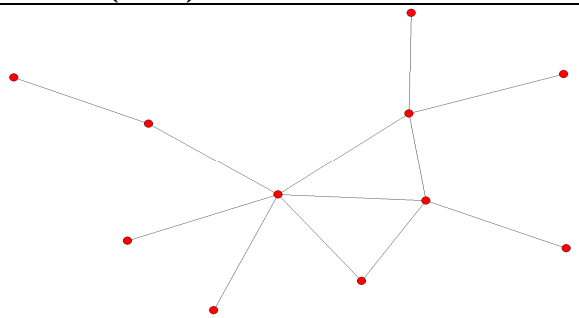
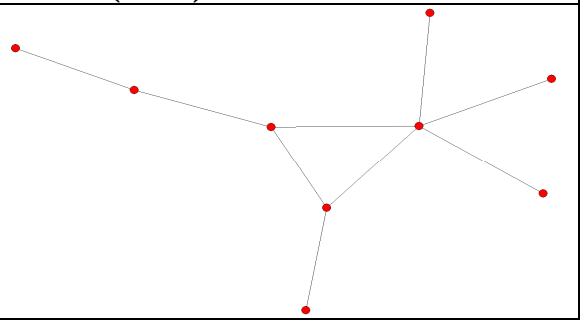
Case#5 - Blyth Court

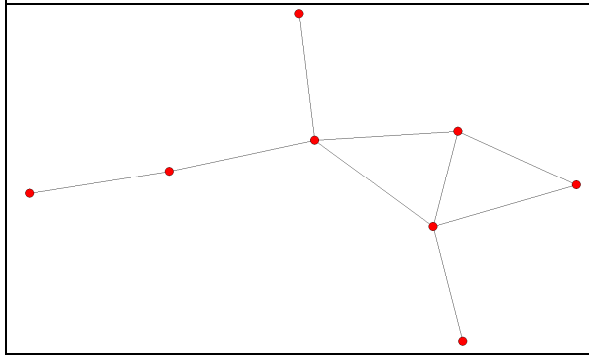
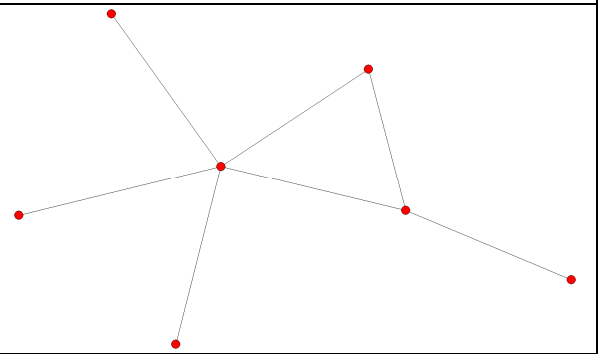
Entire Configuration	Wave #1 (Apr09)	Wave #2 (May09)
		
Wave #3 (Jun09)	**Wave #4 (Jul09)**	**Wave #5 (Aug09)**
		
Wave #6 (Sep09)	**Wave 7 (Oct09)**	**Wave #8 (Nov09)**
		

Wave #9 (Dec09)	Wave #10 (Jan10)	Wave #11 (Feb10)
		

Wave #12 (Mar10)


Case#6 - Oakley Road		
Entire Configuration	**Wave #1 (Jan08)**	**Wave #2 (Feb08)**
		
Wave #3 (Mar08)	**Wave #4 (Apr08)**	**Wave #5 (May08**
		
Wave #6 (Jun08)	**Wave #7(Jul08)**	**Wave #8 (Aug08**
		

Case#7 - Washbrook Road		
Entire Configuration	**Wave #1 (Apr09)**	**Wave #2 (May09)**
		
Wave #3 (Jun09)	**Wave #4 (Jul09)**	**Wave #5 (Aug09)**
		
Wave #6 (Sep09)	**Wave #7 (Oct09)**	**Wave #8 (Nov09)**
		

Wave #9 (Dec09)	Wave #10 (Jan10)
	

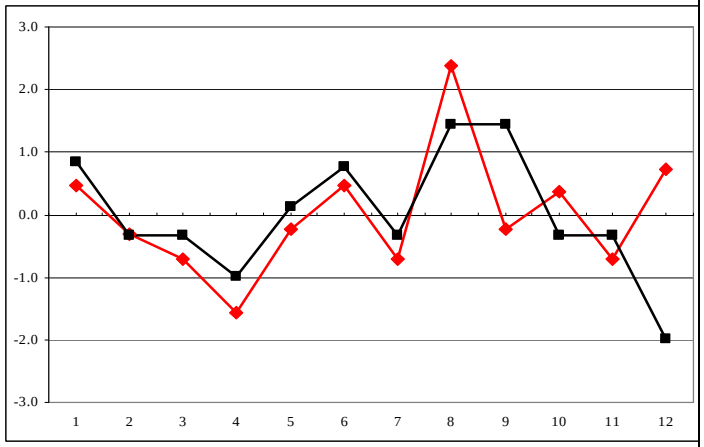
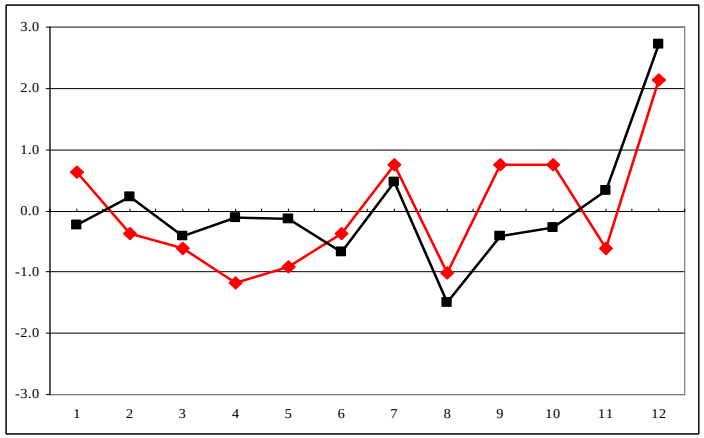
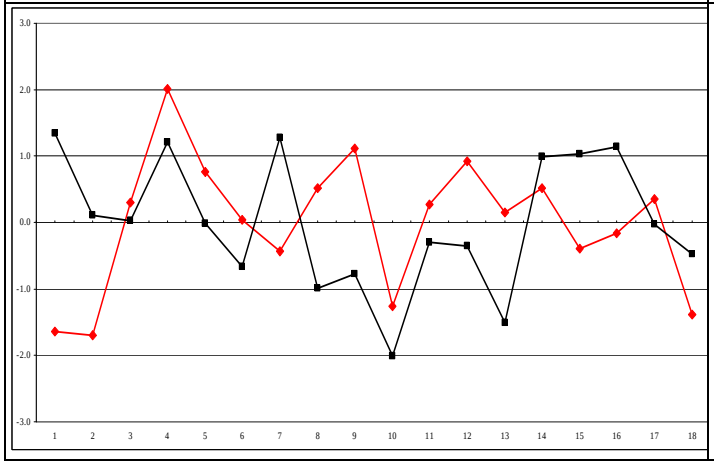
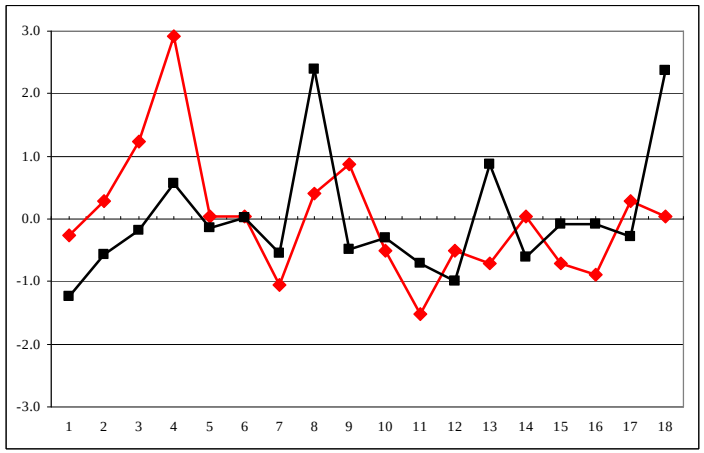
Appendix 3.4 Coordination Mechanisms of Dynamic Inter-Organisational Relationships (Standardised values; *z-scores*)

		W1	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**	**W11**	**W12**	**W13**	**W14**	**W15**	**W16**	**W17**	**W18**	**W19**
Dale Lane (Case#1)	Contracting	0.475	-0.312	-0.706	-1.572	-0.225	0.475	-0.706	2.387	-0.225	0.377	-0.706	0.738							
	Monit. Org.	0.637	-0.366	-0.616	-1.168	-0.923	-0.366	0.762	-1.010	0.762	0.762	-0.616	2.141							
	Density	-0.222	0.227	-0.415	-0.114	-0.137	-0.672	0.469	-1.501	-0.415	-0.267	0.321	2.725							
	Hierarchy	0.848	-0.334	-0.334	-0.994	0.138	0.769	-0.334	1.447	1.447	-0.334	-0.334	-1.985							
Fulmar Road (Case#2)	Contracting	-1.644	-1.690	0.304	2.009	0.759	0.045	-0.432	0.521	1.116	-1.265	0.270	0.918	0.155	0.521	-0.395	-0.159	0.351	-1.384	
	Monit. Org.	-0.256	0.278	1.241	2.925	0.043	0.043	-1.055	0.409	0.867	-0.506	-1.517	-0.506	-0.717	0.043	-0.717	-0.898	0.278	0.043	
	Density	-1.236	-0.576	-0.187	0.564	-0.150	0.013	-0.546	2.401	-0.485	-0.298	-0.708	-0.990	0.871	-0.616	-0.071	-0.071	-0.294	2.380	
	Hierarchy	1.337	0.112	0.024	1.203	-0.016	-0.669	1.272	-0.986	-0.780	-2.015	-0.299	-0.353	-1.501	0.996	1.028	1.143	-0.028	-0.470	
North Wingfield (Case#3)	Contracting	0.072	0.934	-0.667	0.811	2.288	1.80	-0.790	0.072	0.072	0.072	-1.159	-0.962	0.072	-1.652	-1.121	-0.398	-0.326	0.417	0.470
	Monit. Org.	0.840	0.363	1.453	-0.182	2.270	0.36	-0.590	1.126	0.840	-1.543	-1.271	-1.162	-0.590	0.363	-0.810	-0.330	0.070	-0.399	-0.810
	Density	0.558	-0.771	1.148	-1.060	-1.060	1.94	0.520	-0.720	0.810	-0.738	-0.540	-0.337	0.089	-0.341	1.213	-0.405	-0.423	-0.877	0.032
	Hierarchy	0.200	0.323	-0.046	0.361	0.179	-2.45	-0.547	1.122	-0.679	0.008	0.354	-0.174	0.135	0.595	0.112	1.213	0.562	-0.866	0.640
Rowlett Road (Case#4)	Contracting	0.065	-0.699	0.524	-1.810	0.524	1.048	1.048	-0.699											
	Monit. Org.	-0.806	-1.151	-0.806	-0.523	0.230	1.414	1.414	0.230											
	Density	0.258	-0.764	-0.571	-1.035	1.848	-0.239	-0.571	1.074											
	Hierarchy	-0.950	0.885	-0.163	0.885	-1.213	0.885	0.885	-1.213											
Blyth Court (Case#5)	Contracting	-0.915	-1.709	-0.563	0.184	0.335	-0.915	0.184	0.848	2.258	0.243	-0.093	0.143							
	Monit. Org.	-0.655	-0.995	-0.882	-1.095	-0.223	-0.655	0.503	1.382	1.835	1.188	-0.429	0.024							
	Density	-0.578	-0.636	-0.552	-0.356	-0.415	-0.802	-0.688	-0.106	2.455	1.309	-0.415	0.785							
	Hierarchy	0.340	-0.142	-0.205	0.120	1.168	1.225	0.378	0.468	-1.547	-2.170	0.635	-0.270							
Oakley Road (Case#6)	Contracting	-1.102	1.068	0.854	-1.102	-0.642	0.213	1.353	-0.642											
	Monit. Org.	-0.223	0.820	0.142	-1.683	0.142	-0.536	-0.385	1.723											
	Density	-0.502	0.017	1.152	-0.850	-0.326	-1.043	-0.296	1.848											
	Hierarchy	0.775	0.260	-1.212	0.641	1.248	-0.042	0.030	-1.700											
Washbrook Road (Case#7)	Contracting	-0.330	-0.428	1.580	0.943	1.307	-0.472	-0.214	0.094	-1.603	-0.876									
	Monit. Org.	-0.779	-0.303	-0.779	-0.779	-0.484	-1.008	0.158	0.823	1.281	1.870									
	Density	-1.202	1.732	-0.343	-1.327	-0.349	-0.592	-0.339	1.070	0.806	0.543									
	Hierarchy	-0.124	0.303	0.332	1.268	1.098	-0.599	0.986	-0.574	-1.932	-0.759									

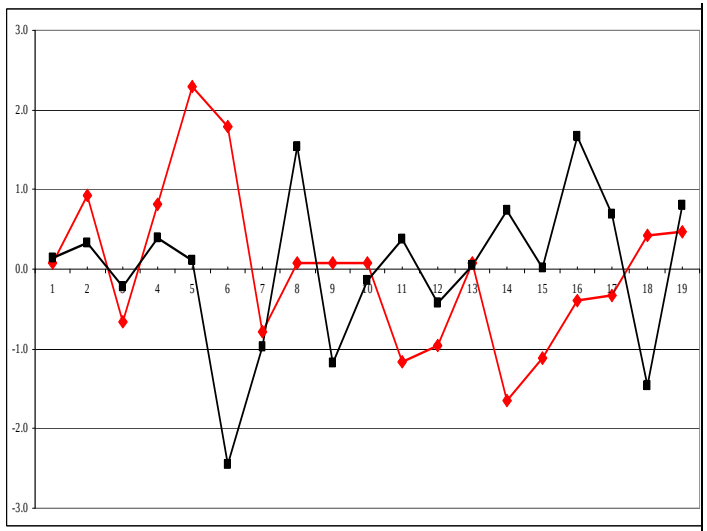
W – Wave (observation point in time)

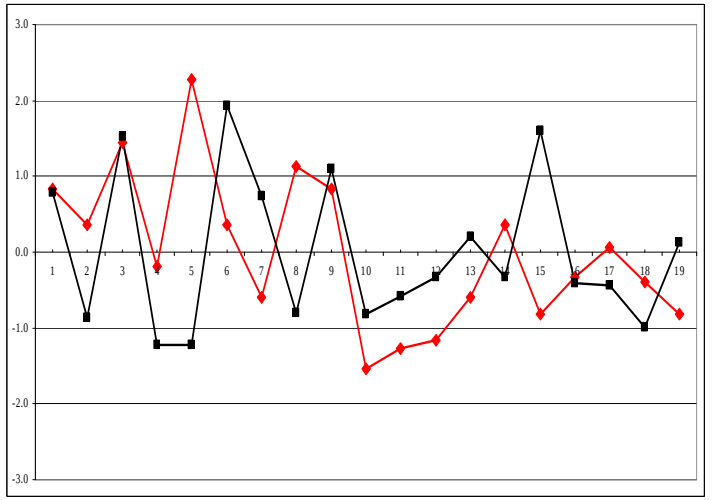
Contracting – Use of contracting
Monit. Org. – Monitoring organisations

Appendix 3.5 Graphic Visualisation of the Variation of the Variables Underlying Organising and Relating

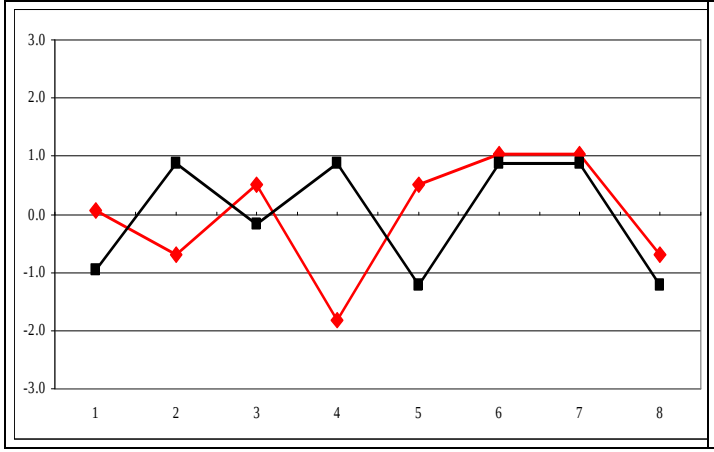
Use of Contracting and Hierarchy*	**Monitoring Organisations and Density***	**Case Story** (Summary)
		**Dale Lane (**Case#1) provides a clear example of the interplay between administrative coordination mechanisms and the structure of the inter-organisational relationships. For instance, there are concomitant variations of contracting and hierarchy within inter-organisational relationships up to Wave 9 (out of 12 *waves*). A similar trajectory is observable for the positive relation between variations of the proportion of monitoring organisations and density of inter-organisational relationships. Overall Coordination^{+}: **Low**
		**Fulmar Road (**Case#2) is one of the longest projects studied (18 *waves* in total). Nonetheless, a positive variation between administrative coordination mechanisms and structure of inter-organisational relationships is observable throughout the design and build life-cycle. Clearly, contracting has an important role in developing goal-congruence among organisations. Contracting is associated with hierarchy within inter-organisational relationships. This is observed for Wave7, Wave15 and Wave16. Overall Coordination^{+}: **Medium**

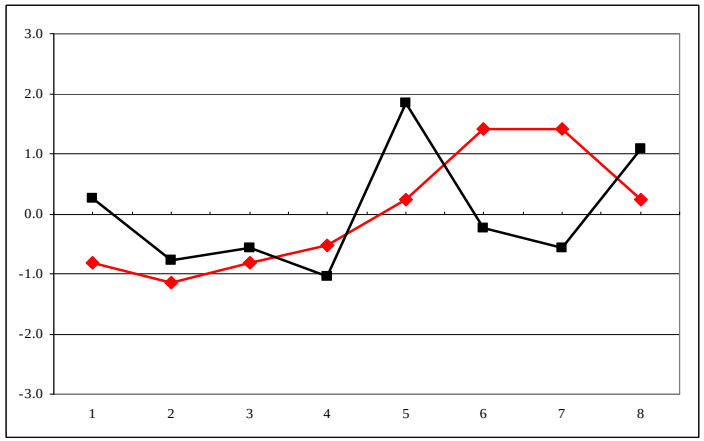
(Figure continues in the next page)





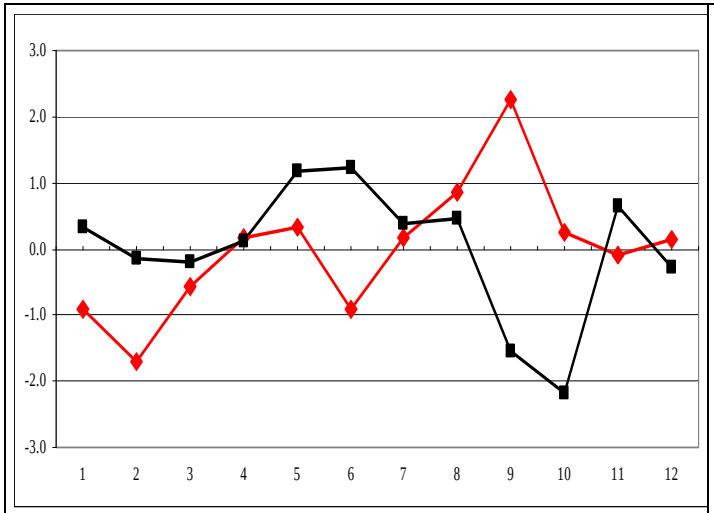
North Wingfield road (Case#3) has the longest observation period (19 *waves*) among all 7 case-studies. The conversion of this former colliery village into a new social housing development for the community in Derbyshire entailed a configuration of inter-organisational relationships in which density was constantly shaped by the use of managing organisations. Such a positive relationship was noted for the entire design and build life-cycle. This extended from January 2008 to December 2009. The highest register of hierarchy within inter-organisational relationships occurred early in Wave8 and Wave16.
Overall Coordination^{+}: **Low**

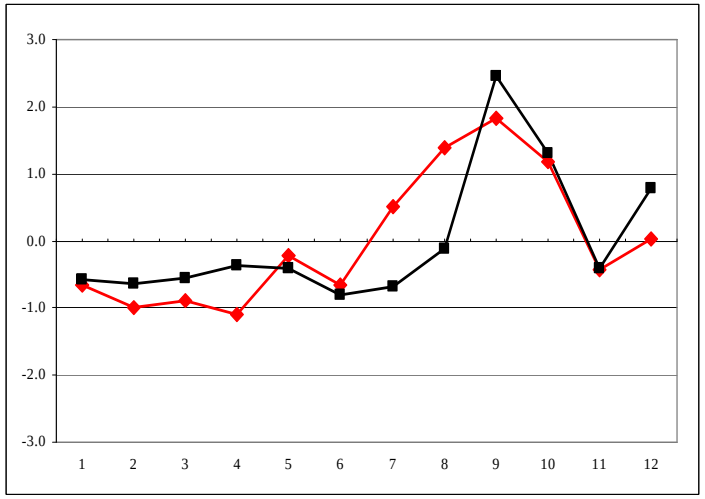




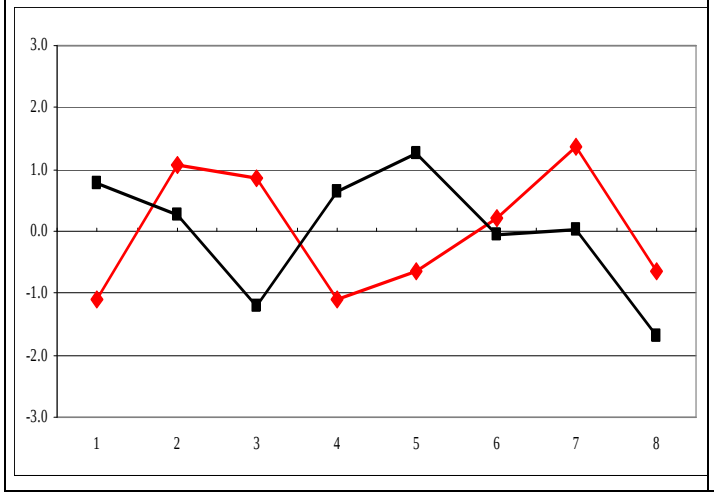
Rowlett Road (Case#4) experienced *high* coordination whereas the proportion of monitoring organisations steadily increased over time. Both hierarchy and density denoted rather unstable patterns over time. A unique feature to this configuration was, perhaps, the use in turns of the variation of contracting and monitoring organisations (i.e. administrative forms of coordination).
Overall Coordination^{+}: **High**

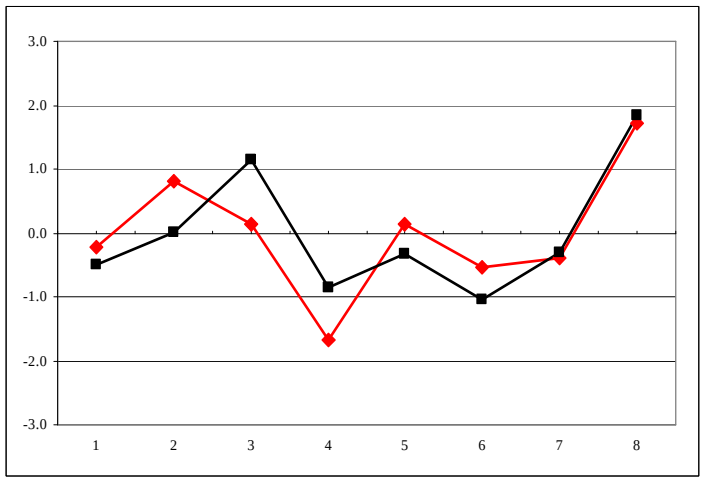
(Figure continues in the next page)





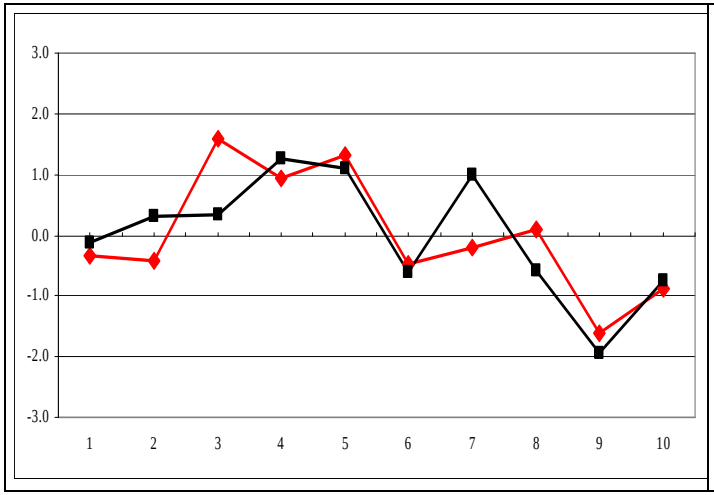
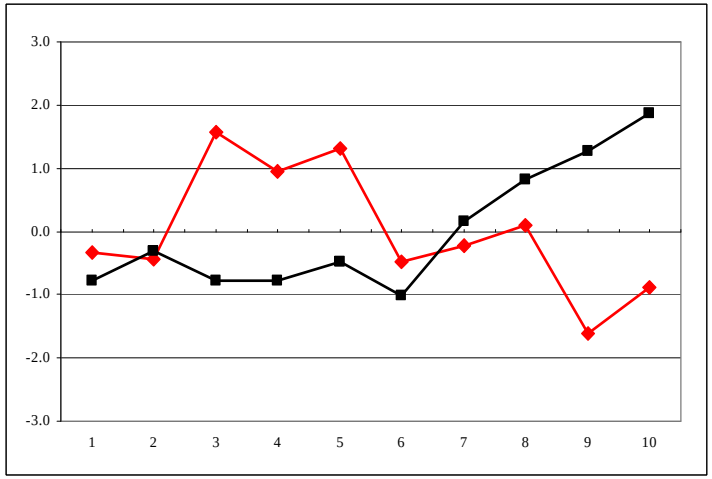
Blyth Court (Case#5) was a project delivered by a configuration of inter-organisational relationships characterised by an increasing hierarchy over time (up to Wave 8, out of 12 Waves) alongside a steady increase of contracting (for the same period). The hiring of monitoring organisations occurred mainly toward the end of the project (from Wave 8 onwards). The Blyth Court case experienced the longest period of negative variations on the proportion of monitoring organisations (8 *waves*).
Overall Coordination^{+}: **Medium**





Oakley Road (Case#6) aimed at delivering a new Women's refuge following the closure of the local refugee in 2000. Administrative coordination mechanisms and structural attributes of inter-organisational relationships over time evidently varied in parallel. Like Case#4, the newly-built social housing project in Oakley Road that alternated between the two administrative coordination mechanisms. A decrease of contracting (and therefore hierarchy) towards the end of the project contrasted with an increase of monitoring organisations (and therefore density).
Overall Coordination^{+}: **High**

(Figure continues in the next page)

		**Washbrook Road (**Case#7) displayed a pronounced closeness between the variations of the use of contracting and hierarchy over time. One important aspect was the steady increase of the density of inter-organisational relationships after completion of the structure of the building (Wave 6). The last stages of the project were marked by a smooth progress of work across a wide range organisational expertise, from finishings in the building to pruning of trees in the public way. Overall Coordination[+]: **High**

*Graphic representation of the configuration of inter-organisational relationships at every point in time is made available in **Appendix 3.3**. For clarity' sake, the *z-scores* values are not displayed in the graph; however, these are reported in **Appendix 3.4**.

[+] Based on the overall score of coordination consequences (**Chapter IV**).

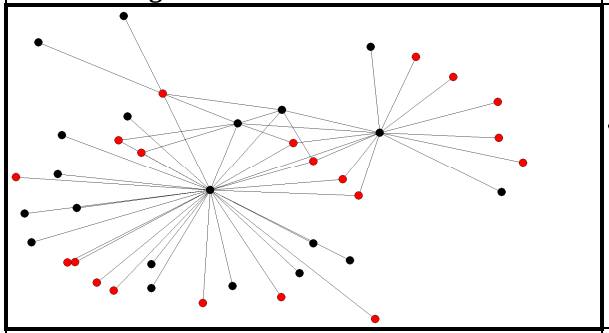
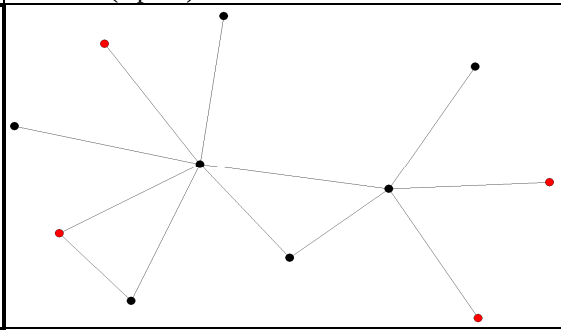
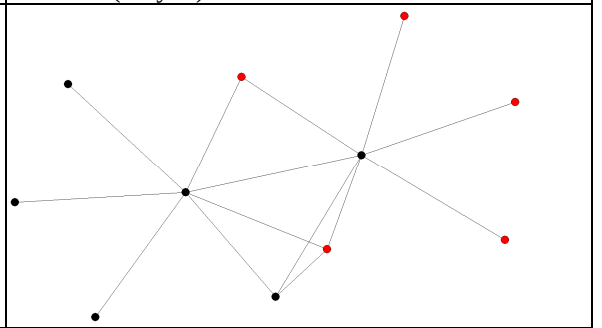
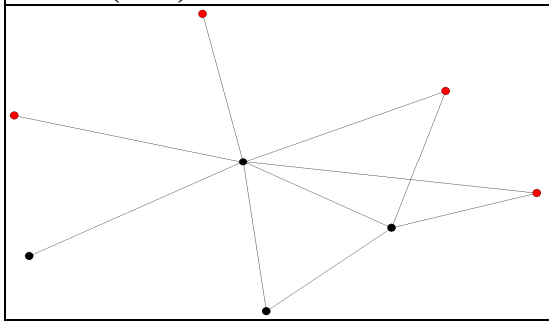
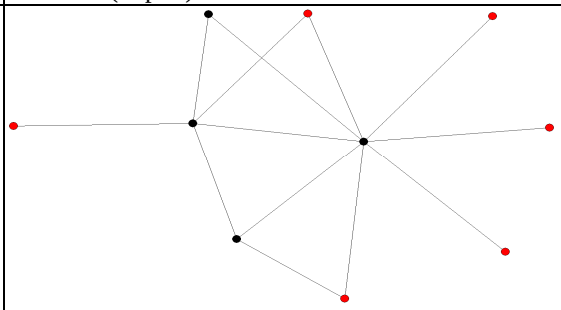
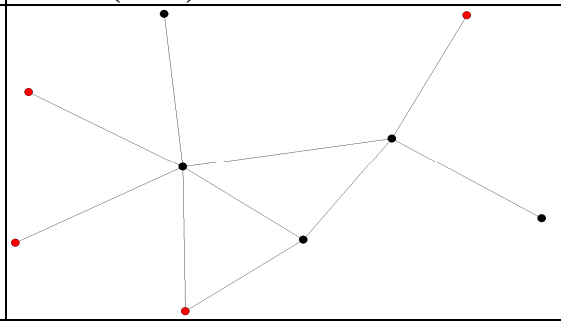
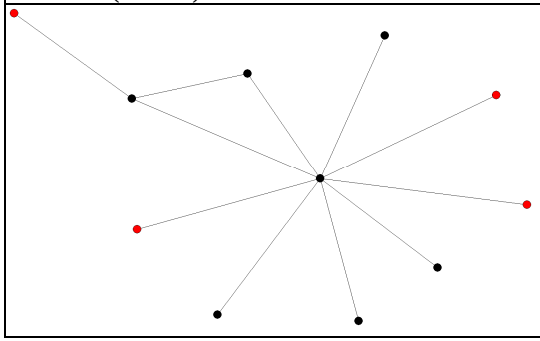
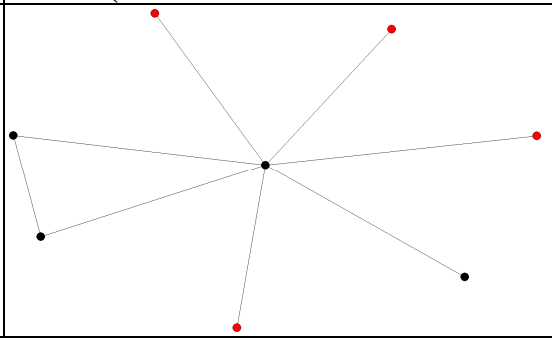
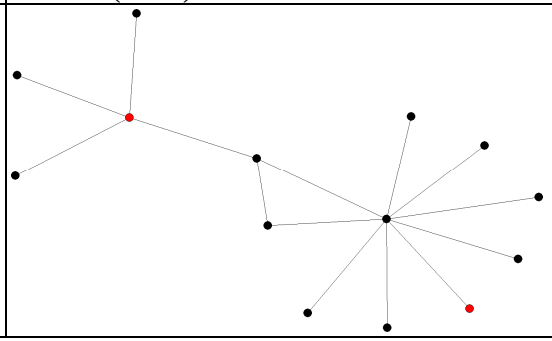
A**ppendix 4.1 Contractual Bottlenecks: Contractual homophily and contractual centrality**

***** This content has been removed by the request of the author *****

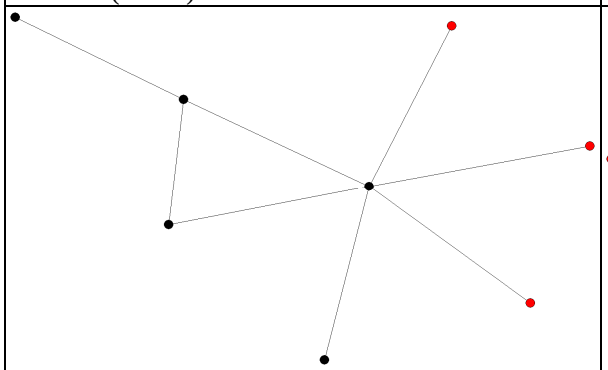
Appendix 4.2 Measure of Organisational Expertise-Driven Homophily

***** This content has been removed by the request of the author *****

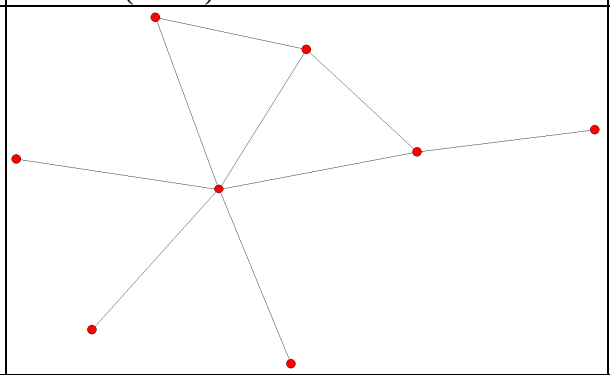
Appendix 4.3 Graphic Representation of Dynamic Inter-Organisational Networks According to Contractual Relationship

Case#1 Dale Lane		
Entire Configuration	**Wave #1** (Apr08)	**Wave #2** (May08)
		
Wave #3 (Jul08)	**Wave #4** (Sep08)	**Wave #5** (Oct08)
		
Wave #6 (Nov08)	**Wave #7** (Dec08	**Wave #8** (Jan09)
		

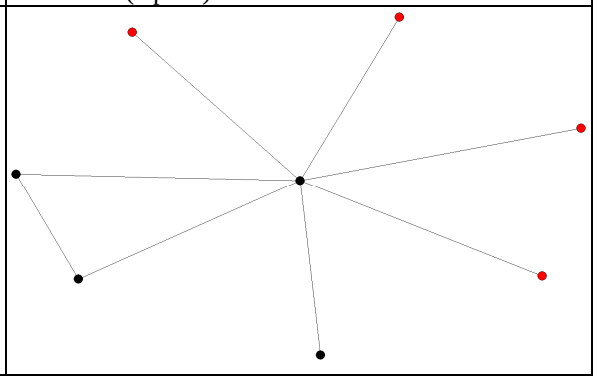
Wave #9 (Feb09)



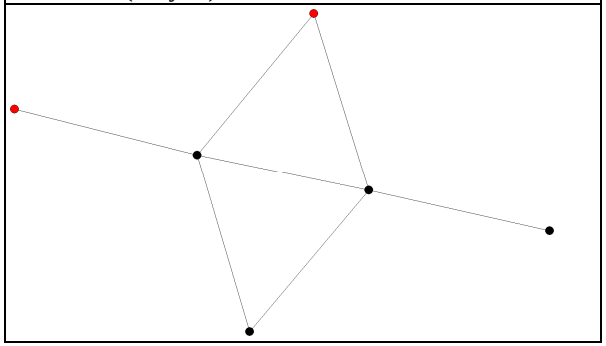
Wave #10 (Mar09)



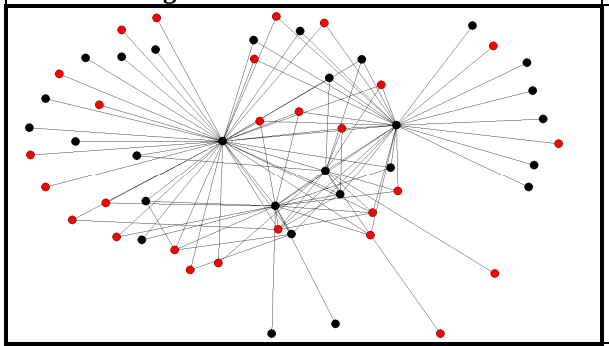
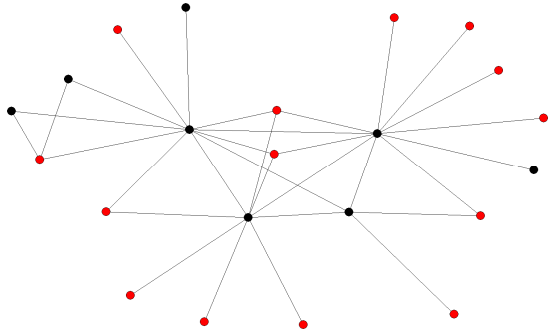
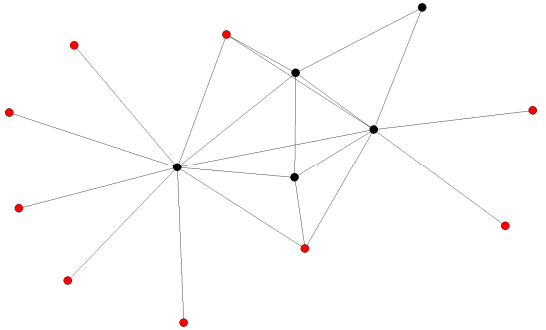
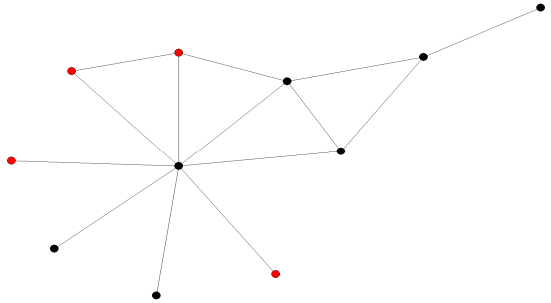
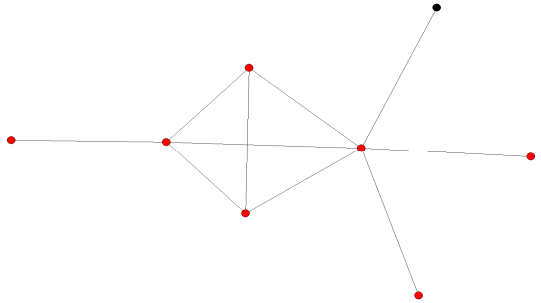
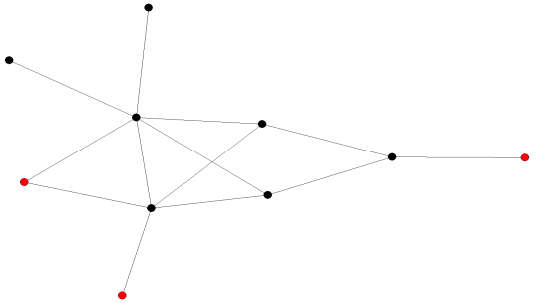
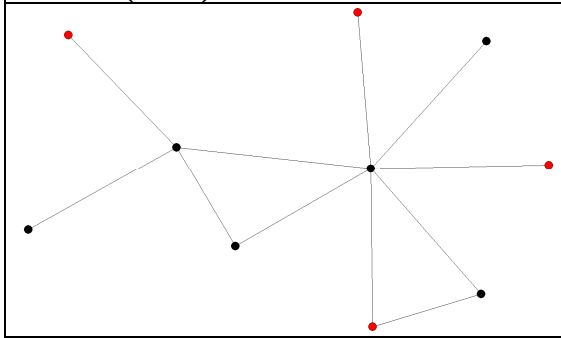
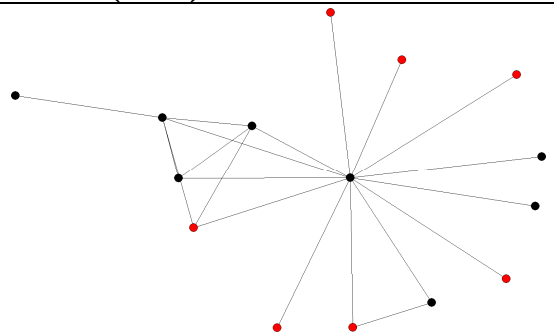
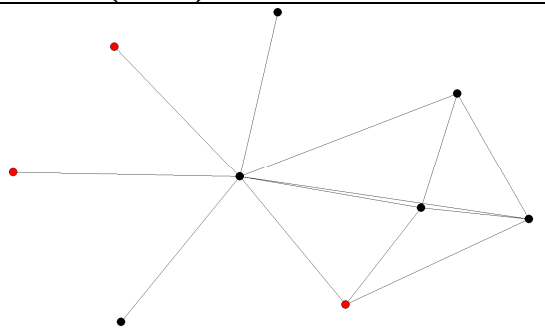
Wave #11 (Apr09)

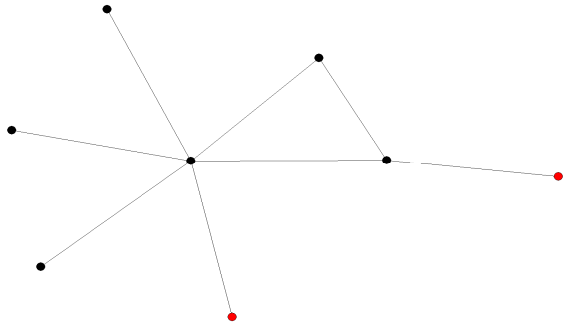
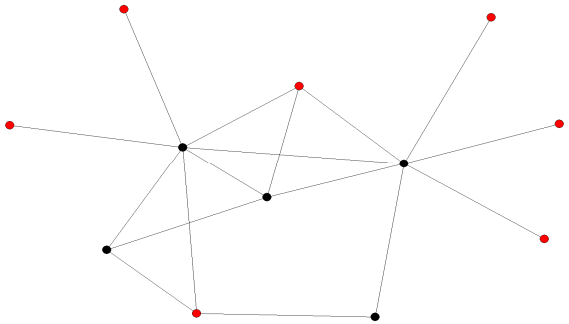
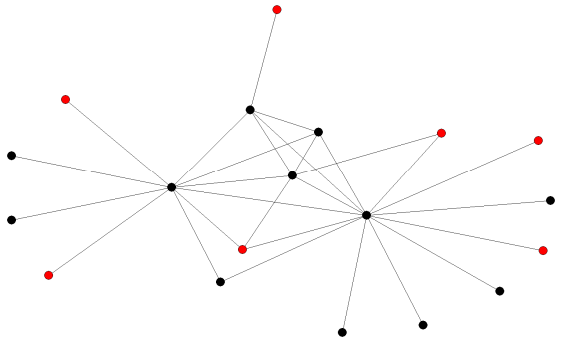
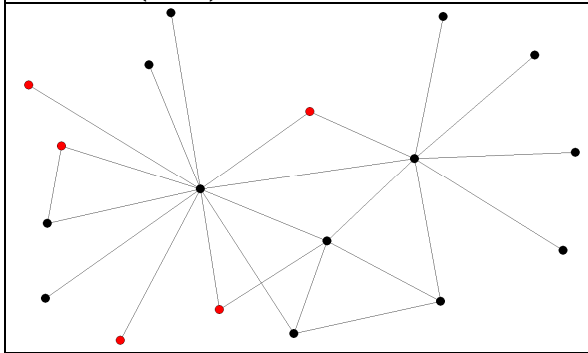
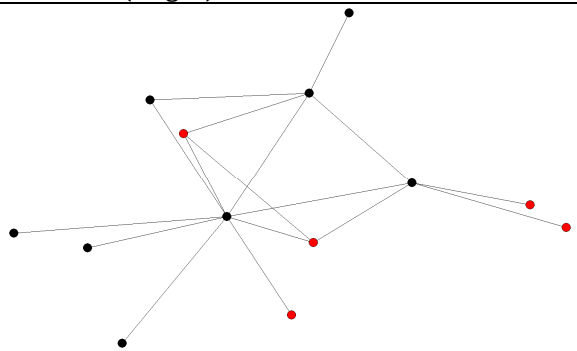
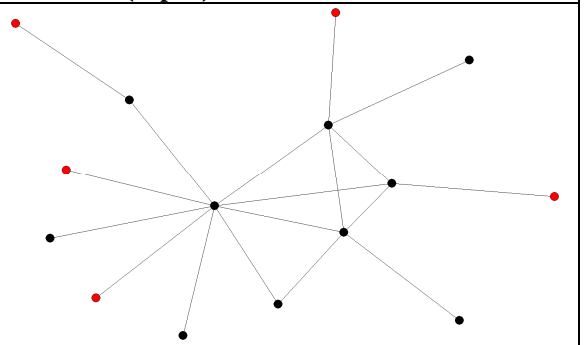
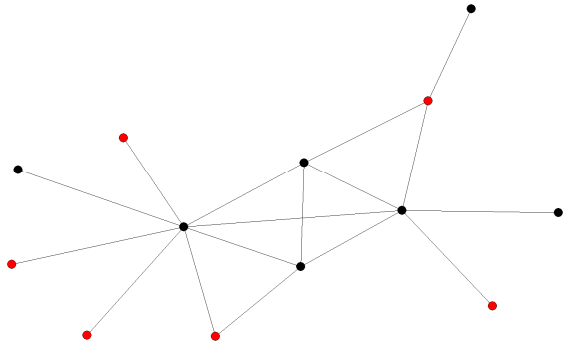
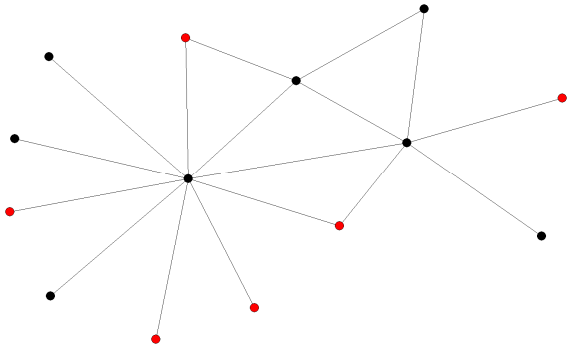
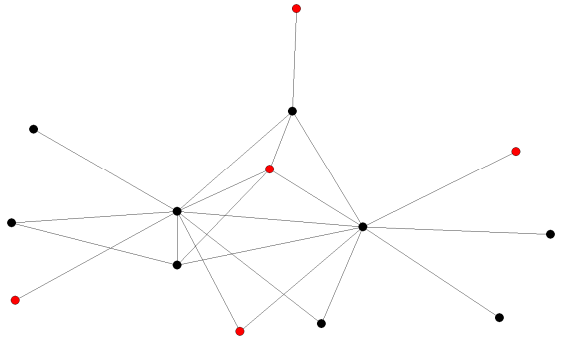


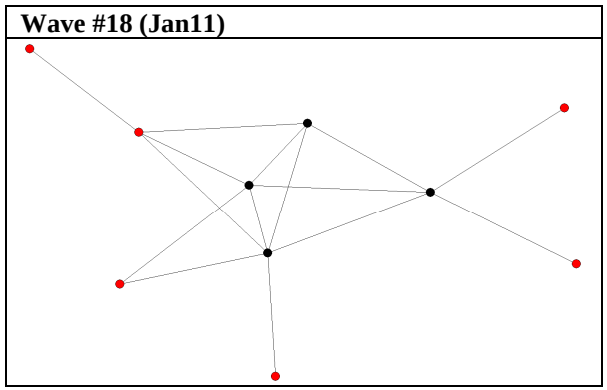
Wave #12 (May09)

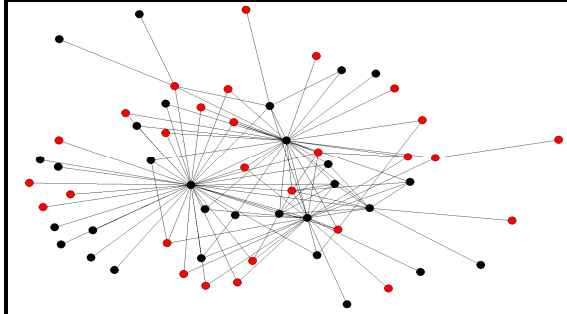
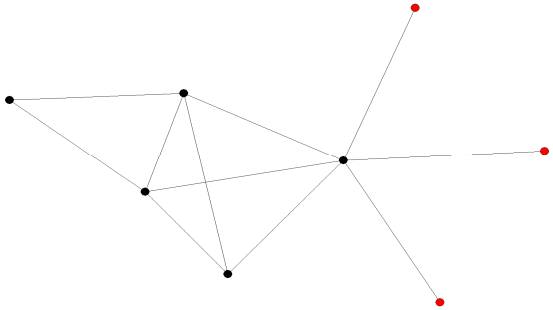
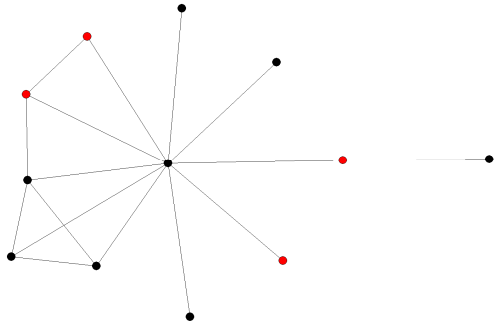
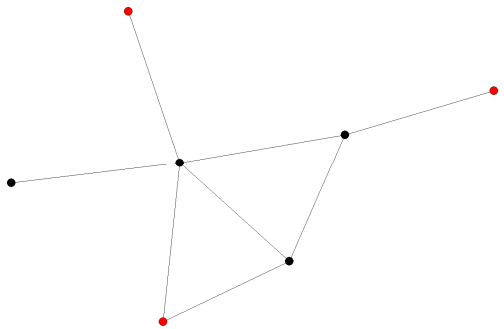
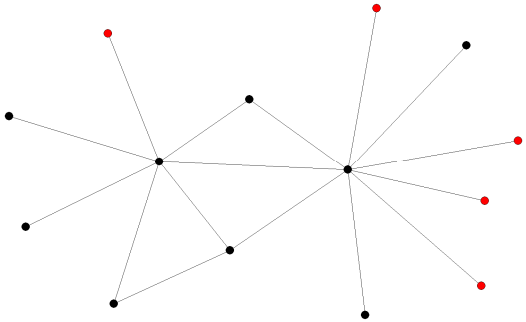
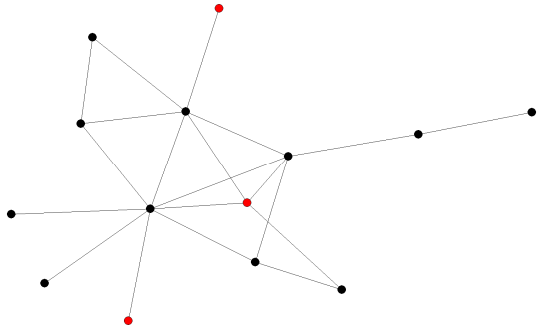
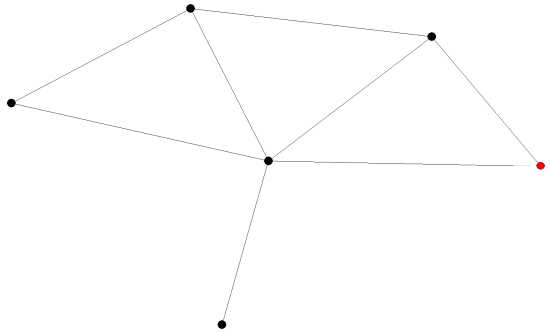
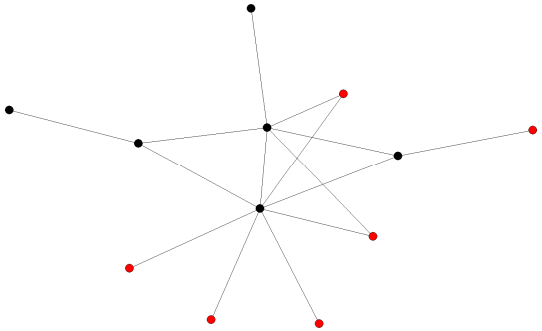
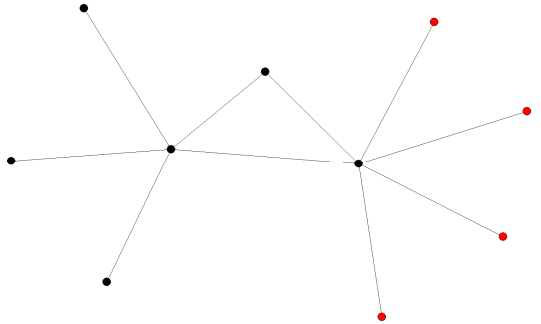


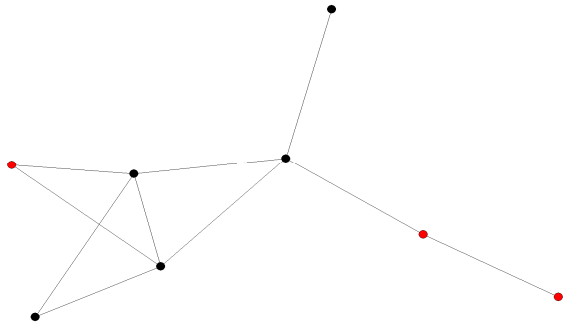
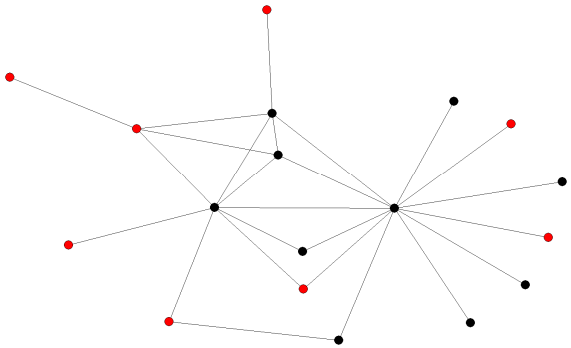
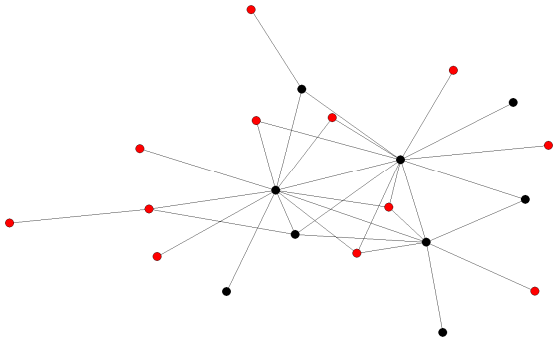
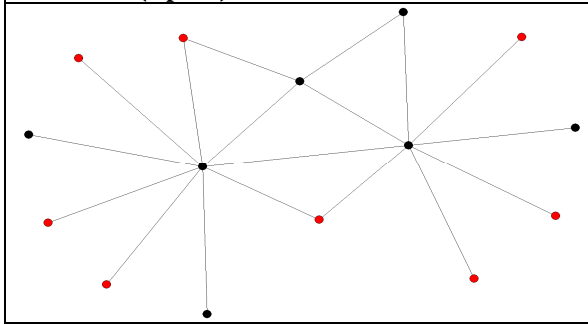
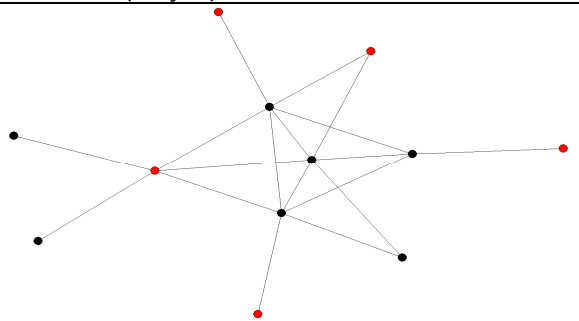
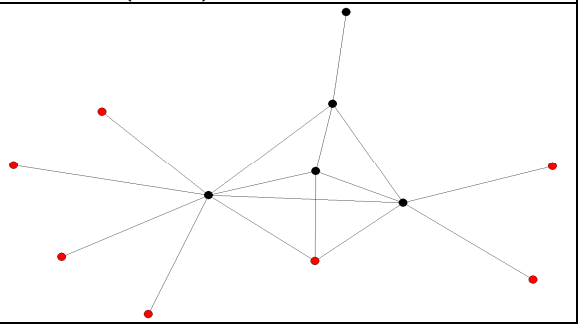
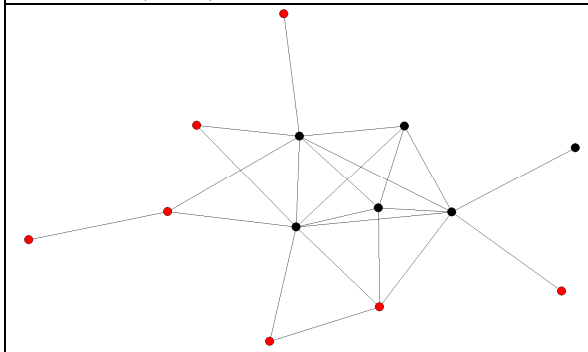
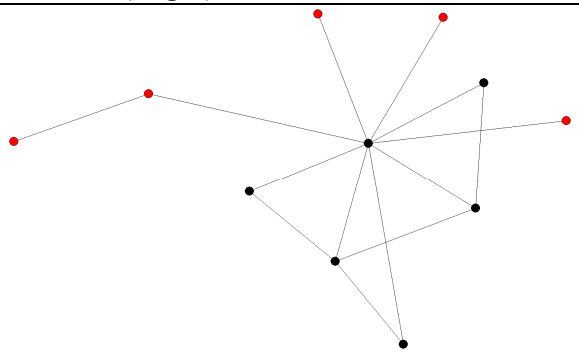
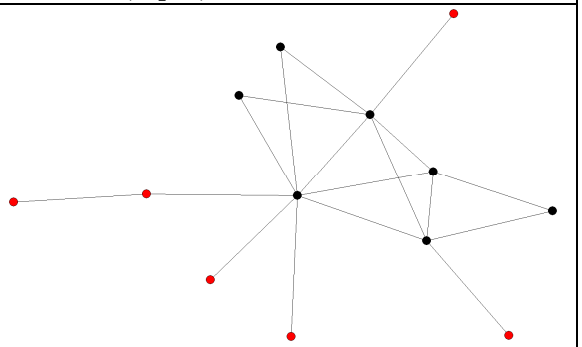
Black-coloured nodes represent organisations on a contractual relationship
Red-coloured nodes represent organisations on a non-contractual relationship

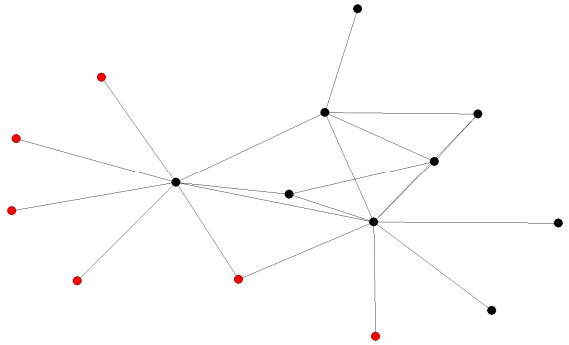
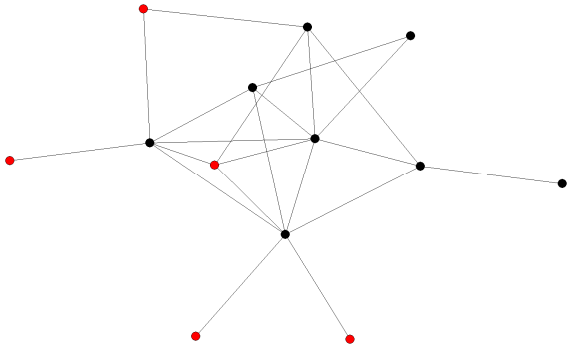
Case#2 Fulmar Road		
Entire Configuration	**Wave #1 (Jun09)**	**Wave #2 (Jul09)**
		
Wave #3 (Aug09)	**Wave #4 (Nov09)**	**Wave #5 (Dec09)**
		
Wave #6 (Jan10)	**Wave #7 (Feb10)**	**Wave #8 (Mar10)**
		

Wave #9 (Apr10)	Wave #10 (May10)	Wave #11 (Jun10)
		
Wave #12 (Jul10)	**Wave #13 (Aug10)**	**Wave #14 (Sep10)**
		
Wave #15 (Oct10)	**Wave #16 (Nov10)**	**Wave #17 (Dec10)**
		

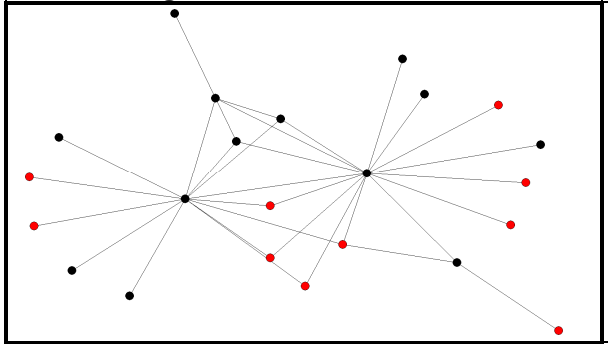
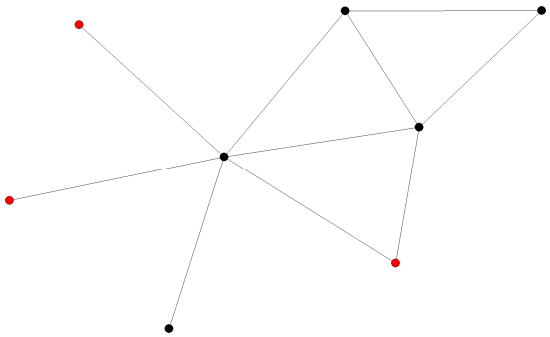
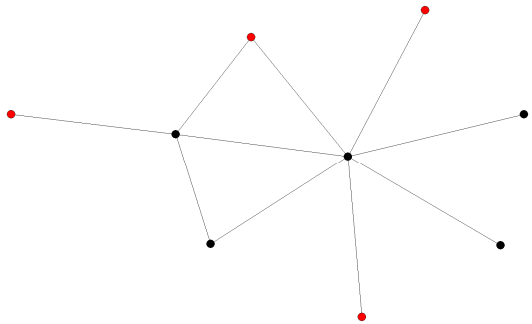
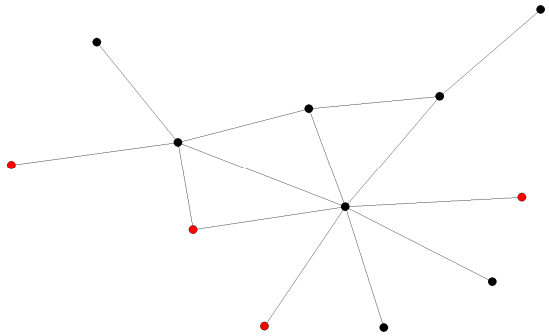
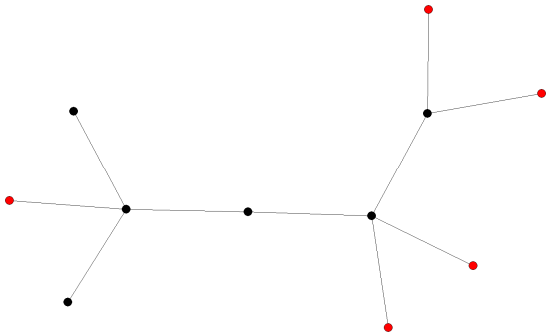
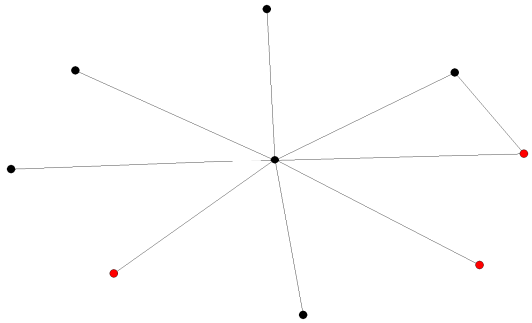
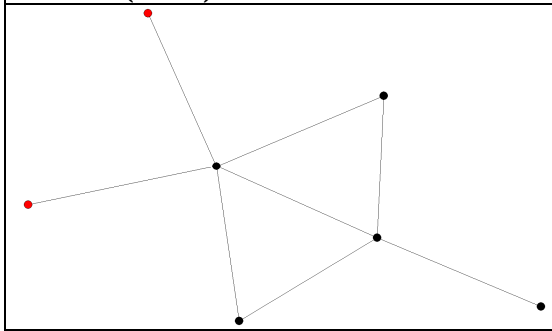
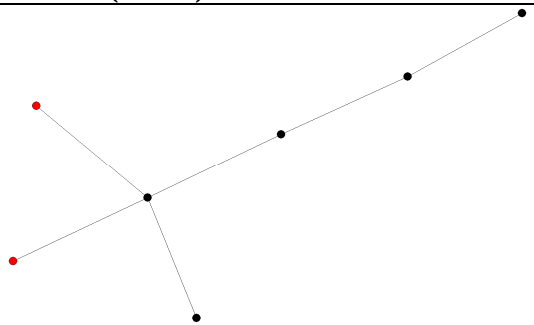
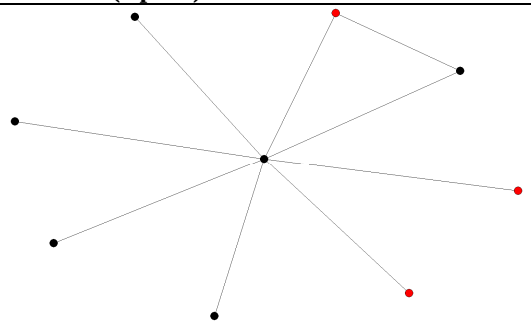

Wave #18 (Jan11)

Case#3 North Wingfield Road		
Entire Configuration	**Wave #1 (Jan08)**	**Wave #2 (Feb08)**
		
Wave #3 (Mar08)	**Wave #4 (Jun08)**	**Wave #5 (Aug08)**
		
Wave #6 (Sep08)	**Wave #7 (Nov08)**	**Wave #8 (Dec08)**
		

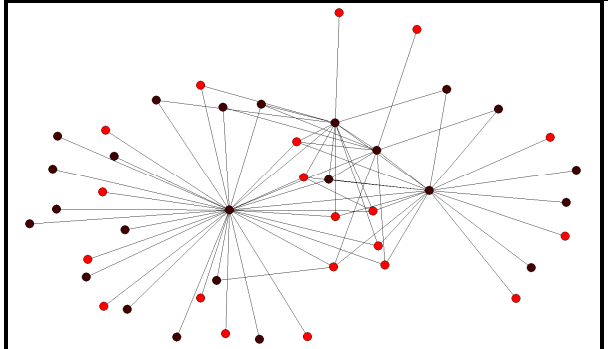
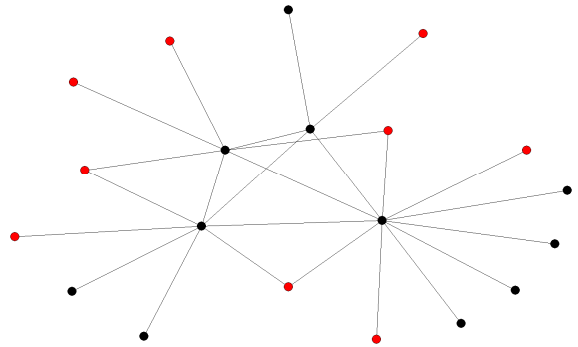
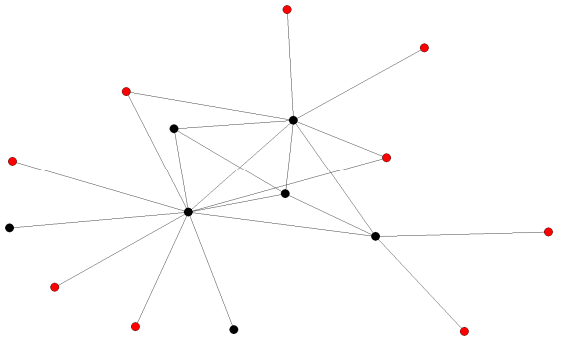
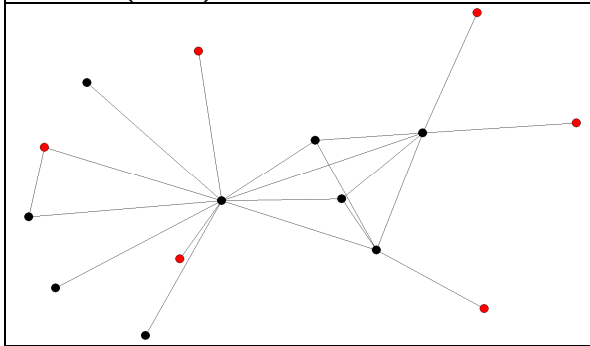
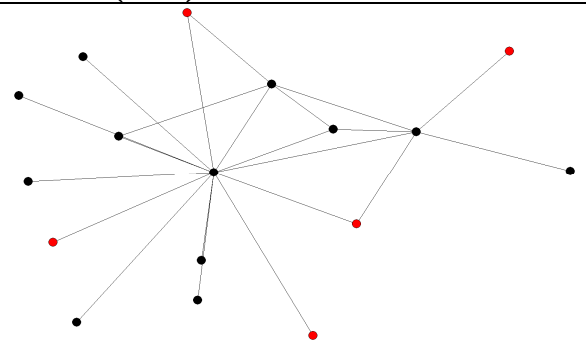
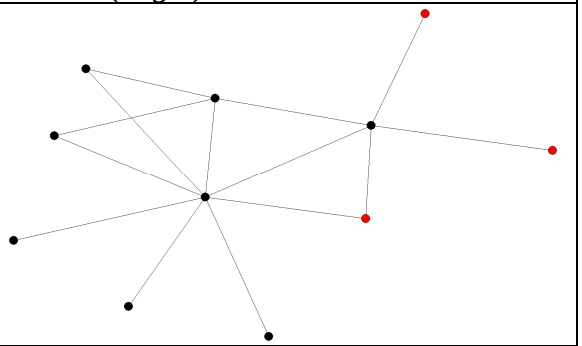
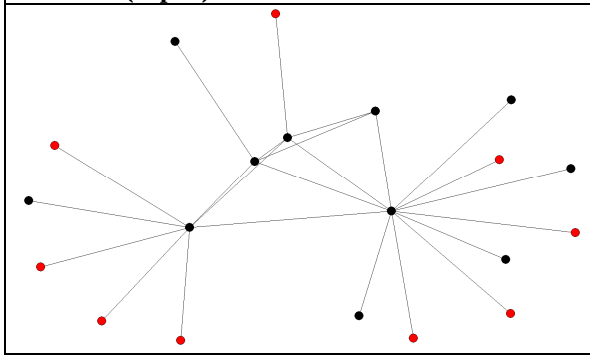
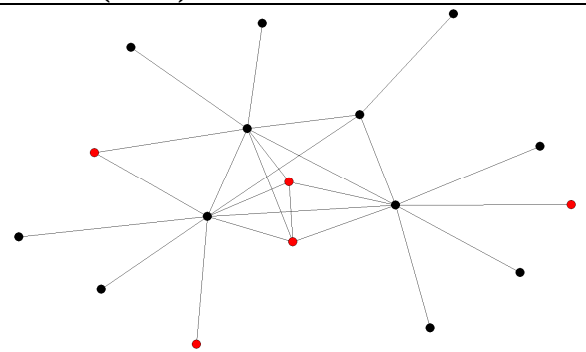
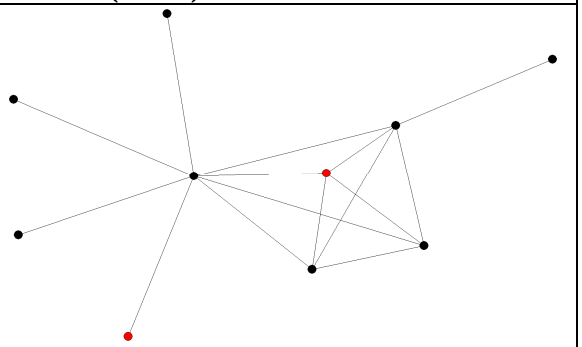
Wave #9 (Jan09)	Wave #10 (Feb09)	Wave #11 (Mar09)
		
Wave #12 (Apr09)	**Wave #13 (May09)**	**Wave #14 (Jun09)**
		
Wave #15 (Jul09)	**Wave #16 (Aug09)**	**Wave #17 (Sep09)**
		

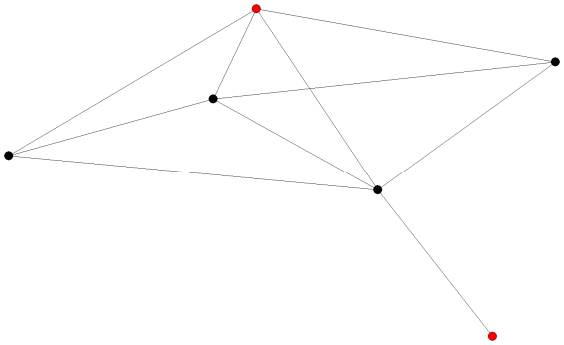
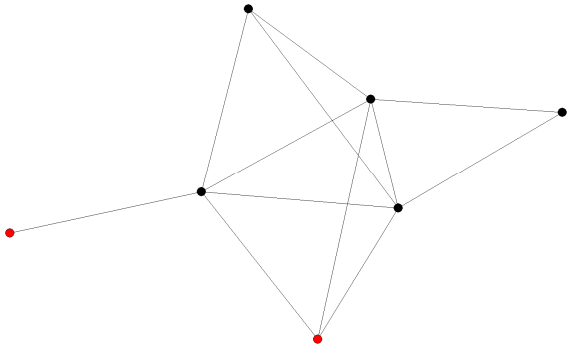
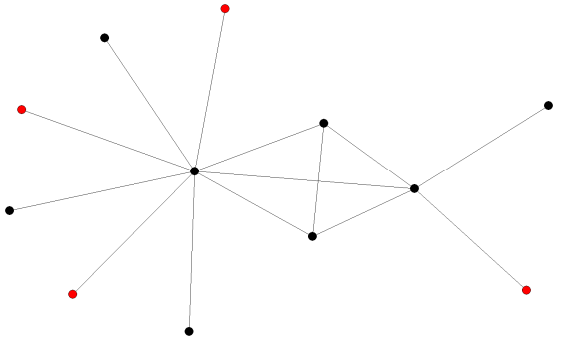
Wave #18 (Oct09)	Wave #19 (Dec09)
	

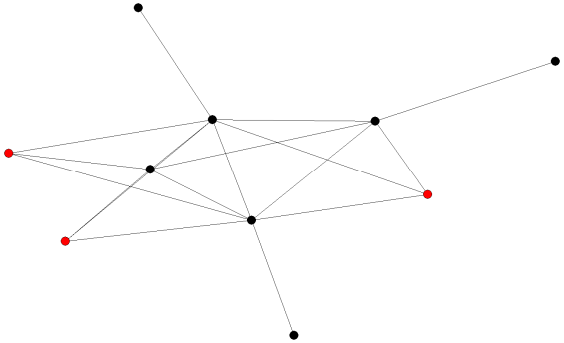
Case#4 - Rowlett Road

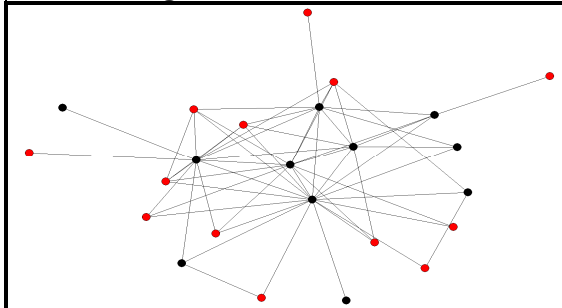
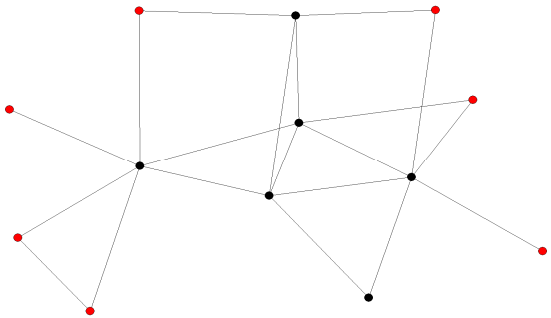
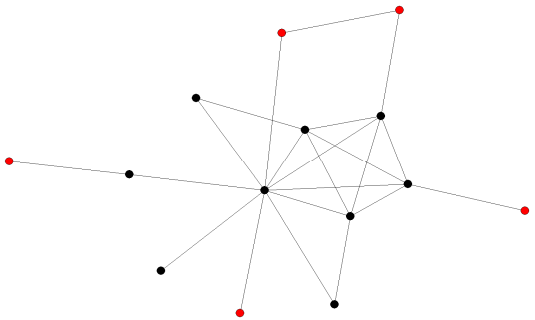
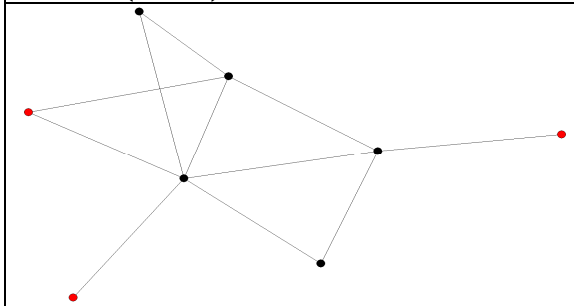
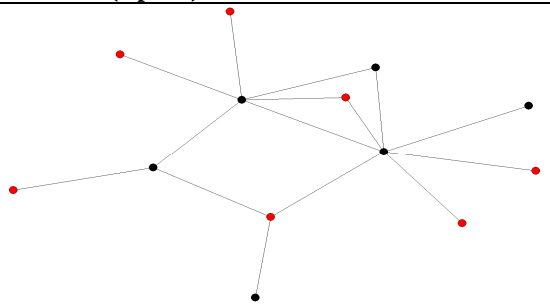
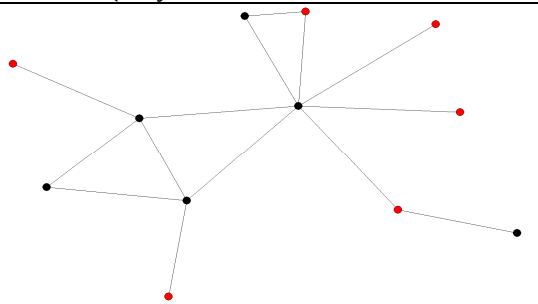
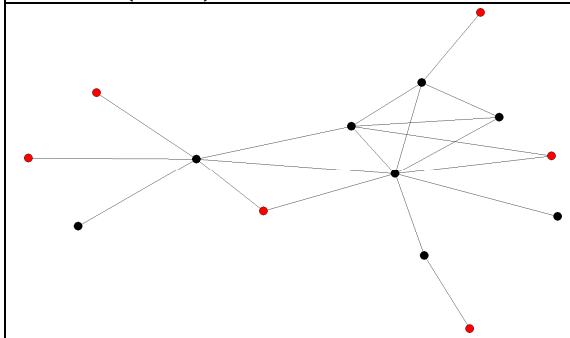
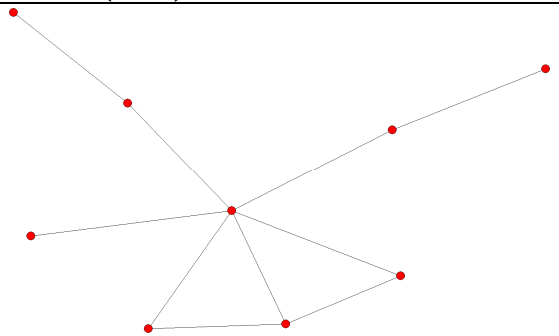
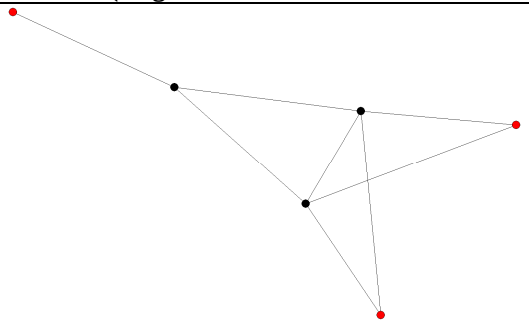
Entire Configuration	Wave #1 (Mar08)	Wave #2 (May08)
		
Wave #3 (Jul08)	**Wave #4 (Oct08)**	**Wave #5 (Jan09)**
		
Wave #6 (Feb09)	**Wave #7 (Mar09)**	**Wave #8 (Apr09)**
		

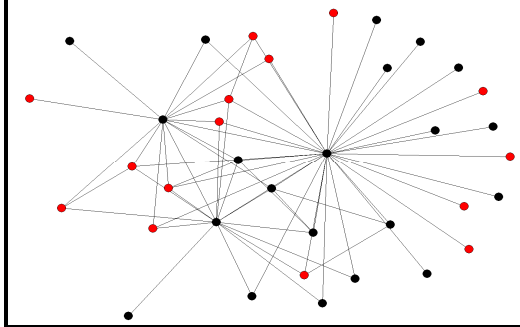
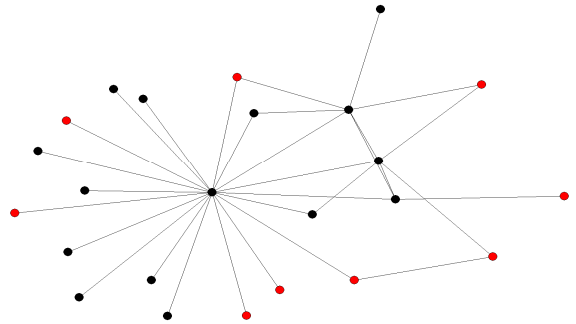
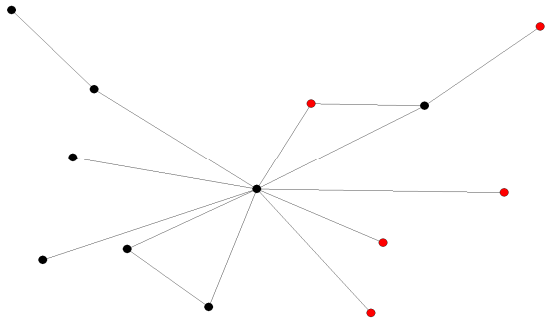
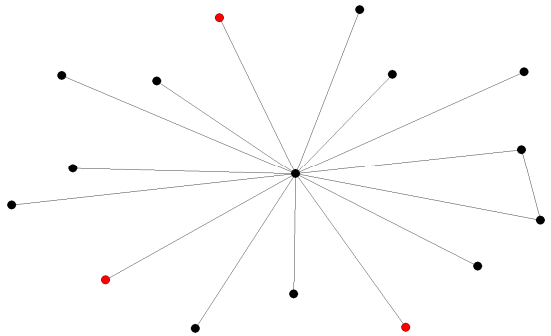
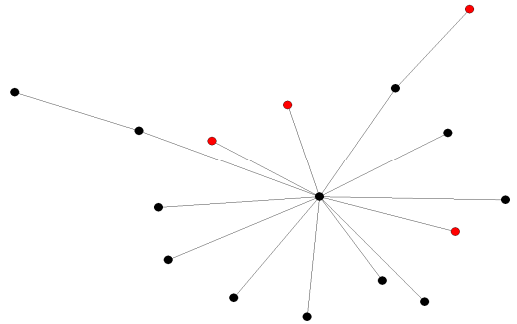
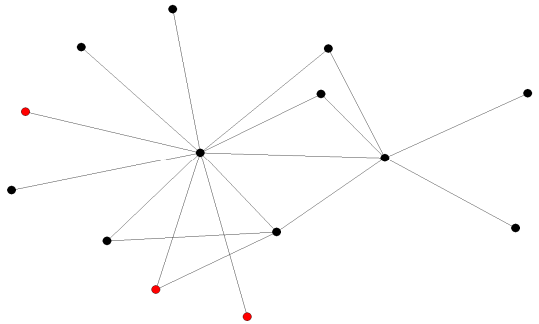
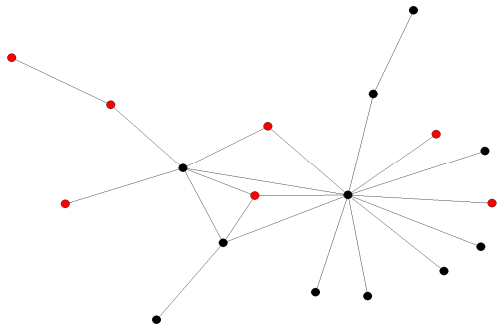
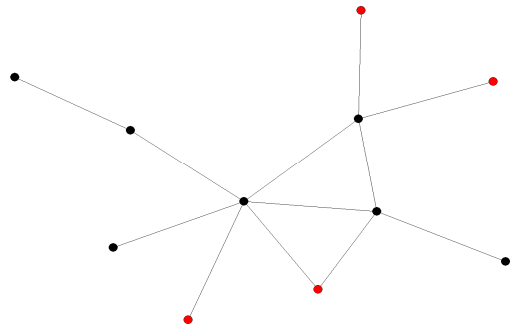
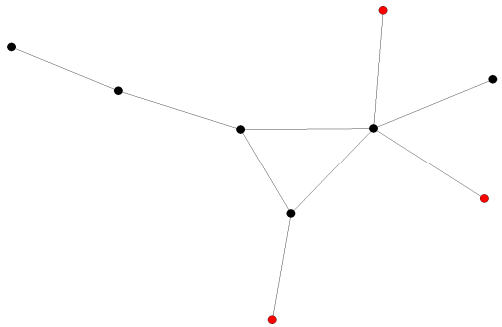
Case#5 - Blyth Court

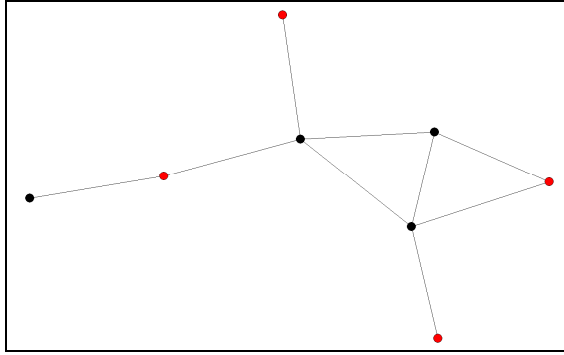
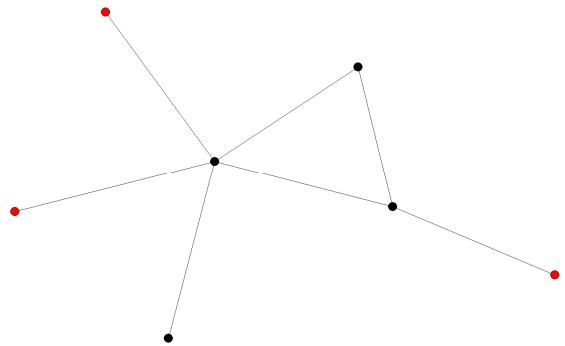
Entire Configuration	Wave #1 (Apr09)	Wave #2 (May09)
		
Wave #3 (Jun09)	**Wave #4 (Jul09)**	**Wave #5 (Aug09)**
		
Wave #6 (Sep09)	**Wave 7 (Oct09)**	**Wave #8 (Nov09)**
		

Wave #9 (Dec09)	Wave #10 (Jan10)	Wave #11 (Feb10)
		

Wave #12 (Mar10)


Case#6 - Oakley Road		
Entire Configuration	**Wave #1 (Jan08)**	**Wave #2 (Feb08)**
		
Wave #3 (Mar08)	**Wave #4 (Apr08)**	**Wave #5 (May08**
		
Wave #6 (Jun08)	**Wave #7(Jul08)**	**Wave #8 (Aug08**
		

Case#7 - Washbrook Road		
Entire Configuration	**Wave #1 (Apr09)**	**Wave #2 (May09)**
		
Wave #3 (Jun09)	**Wave #4 (Jul09)**	**Wave #5 (Aug09)**
		
Wave #6 (Sep09)	**Wave #7 (Oct09)**	**Wave #8 (Nov09)**
		

Wave #9 (Dec09)	Wave #10 (Jan10)
	

Appendix 5.1 Research Outputs and Further Research

Working in progress

Coordination Strategy (research stream 1)

'Influence of Reinforcing Cycles on Effectiveness in Interorganizational Relationships' (Working paper; with Fabrice Lumineau).

'On the Nature of Coordination in Dynamic Interorganizational Relationships' (Working paper).

Micro-Foundations of Dynamic Inter-Organisational Relationships (research stream 2)

'A Theory of Coordination Voids (ToCV) in Dynamic Interorganizational Relationships'

'Trust and Risk in Dynamic Interorganizational Networks' (Working paper)

Research Methodology (research stream 3)

'The Boundary (Mis)Specification Problem: A study on theory-building combining multiple-case study and social network analysis' (Working paper).

'An In-Depth Approach to Social Network Analysis: Relevance, methods and applications'

Conferences Papers

Oliveira, N. (2013). *Boundary (Mis)Specification in Multiple Case-Study and Social Networks Research: Inter-dependence and theory-building.* **SUNBELT XXXIII Social Networks Conference**, 21-26 May, Hamburg, Germany.

Oliveira, N. (2012). *Trust and Risk in Dynamic Inter-Organisational Networks*, 2012 **Annual Meeting of The Academy of Management**, 3-7 August, Boston, Massachusetts, USA.

Oliveira, N. (2012). *Boundary (Mis) Specification Problem in Theory Building: Tales from multiple case-study and social networks research,* **2012 EURAM Conference**, 5 June, Rotterdam, The Netherlands

Oliveira, N. (2012). *Mechanisms of the Development of Multi-Functional Ties in Dynamic Inter-Organizational Networks,* **2012 EURAM Doctoral Colloquium 2012** (Full paper), 5 June, Rotterdam, The Netherlands.

Oliveira, N. (2012). *Administrative and Network-Induced Coordination Mechanisms in Dynamic Inter-Organisational Networks.* **4th Conference on Management & Social Networks**, 16-17 February, 2012, Université de Genève, Switzerland) (using SIENA)

Oliveira, N., Houij Gueddana, W., and Mitev, N. (2012). *Two (Quite Different) Examples of Using Social Network Analysis in Management and Information Systems*. **CEMS** (Consortium of European Management Schools) **& NITIM** (Networks, Innovation Technology & Information Management) **Doctoral Consortium**, Cornivus University, Budapest, 15-17 February 2012.

Oliveira, N., Houij Gueddana, W., and Mitev, N. (2011). *Two (Quite Different) Examples of Using Social Network Analysis in Management and Information Systems*. **Research Seminar at the Institut d'Administration des Entreprises, Universite Pierre Mendes France**, December 15, Grenoble, France.

Oliveira, N. (2011). *Inter-Organisational Trust - Towards a multi-level perspective.* **27th EGOS Colloquium**, Gothenburg, July 6–9, Sweden (with the generous financial support of RADMA - Research and Development Management)

Oliveira, N. (2011). *Contracting and Evolution of Inter-Organisational Relationships – A longitudinal inductive multiple case-study approach*. **LSE-Dauphine Doctoral Workshop** on Networks and Relations Within and Between Organizations – Necessity, challenges and research questions'. Management & Organisation Department (DRM), University Paris-Dauphine, Paris, June 20, France

Oliveira, N. (2011). *Social Network Analysis in Multiple-Case Studies: Promises, evidence, challenges and tentative solutions for 'better stories and better constructs.* **SUNBELT XXXI Social Networks Conference**, St. Petes Beach, Florida, Feb. 8-11, USA

Oliveira, N. (2010). *The Boundary (Mis)Specification Problem: A Study on Theory-Building Combining Multiple-Case Study and Social Network Analysis.* **Fifth Annual Mid-Atlantic Strategy Colloquium (MASC 5)**, University of Maryland Smith School of Business, Maryland, November 12-13, USA

Oliveira, N. (2010). *Centrality and Heterogeneity During the Evolution of Inter-Organizational Networks*. **INFORMS 2010 Annual Meeting.** Austin, Texas, November 7-10, USA

Oliveira, N. (2010). *The Intangible Element in Environmentally Sustainable Construction – Content and structure of inter-firm networks*. **First oikos Young Scholars Entrepreneurship Academy**. Urnäsch, August 22-27, Switzerland (with the financial generous support of RADMA - Research and Development Management)

Oliveira, N. (2010), *Inter-firm Collaboration (Partnering) in the Construction Sector – False dichotomies in a unidirectional debate.* Construction Matter – Managing complexities, decisions and actions in the building process. **CBS - Copenhagen Business School**, Copenhagen, May 5-8, Denmark.

Oliveira, N. (2010). *The Paradox of Trust in Inter-firm Collaboration – Why rigid structures may be better off than trust-based structures.* 5th Workshop on Trust within and between Organisations. **EIASM – European Institute for Advanced Studies in Management**. Madrid, January 28-29, 2010, Spain.

Appendix 6.1 Multimedia Support for Visualisation of Dynamic Inter-Organisational Relationships

***** This content has been removed by the request of the author *****